Heating Piping & Air Conditioning

APRIL 1954

INDUSTRIAL • COMMERCIAL • INSTITUTIONAL • PUBLIC BUILDINGS

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Special exhaust hood is used in ventilating new automotive laboratory 88

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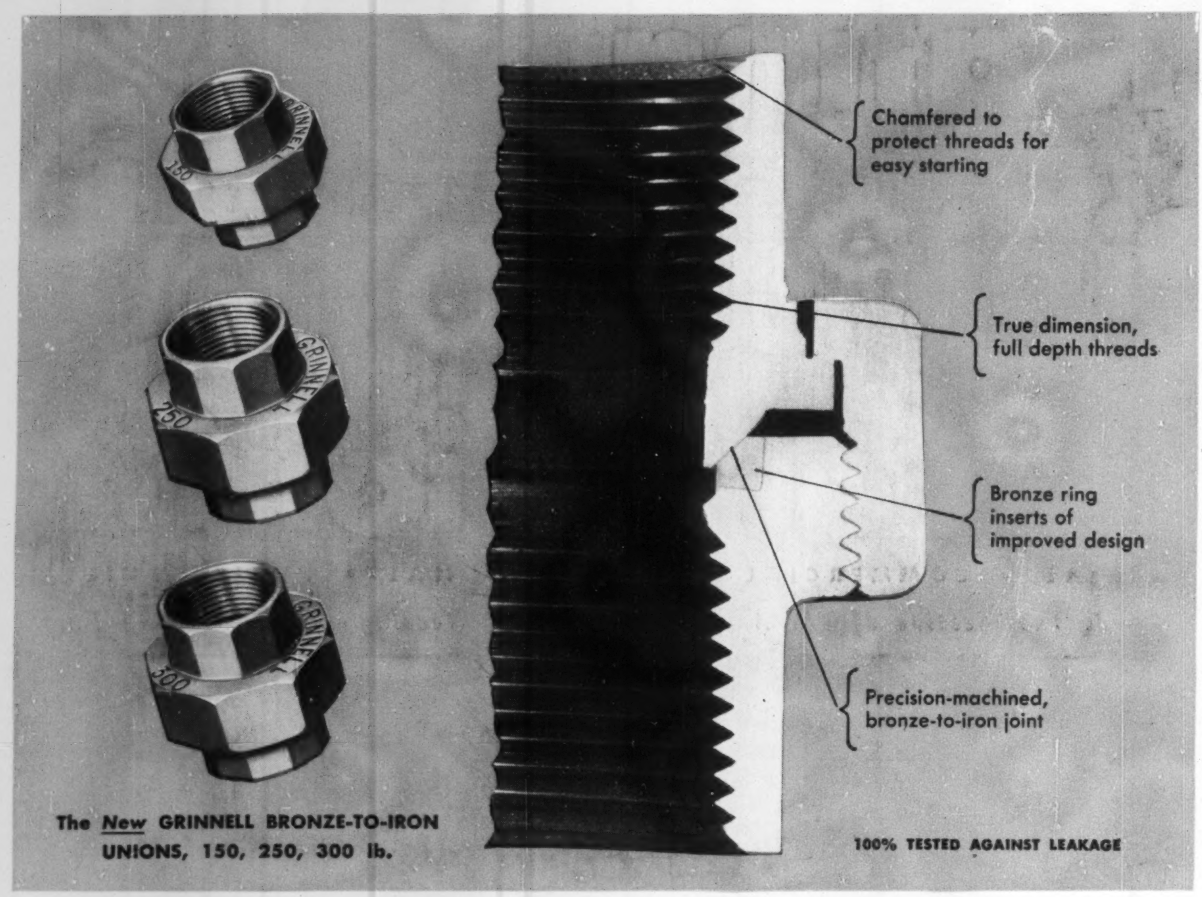
PIPING MAINTENANCE PRACTICES SURVEYED .73


Chamfered to protect threads for easy starting
True dimension, full depth threads
Bronze ring inserts of improved design
Precision-machined, bronze-to-iron joint
GRINNELL
150
250
300

The *New* GRINNELL BRONZE-TO-IRON UNIONS, 150, 250, 300 lb.

100% TESTED AGAINST LEAKAGE

Here's the inside story behind the *new* GRINNELL UNIONS

Cut-away view of the *new* Grinnell bronze-to-iron union reproduced here is *exactly as photographed*. It has not been retouched in *any* way.

The "inside story", as told by the camera, points up the engineering achievement that makes the *new* Grinnell bronze-to-iron union a standard of comparison for the industry.

What the camera cannot show you is the Quality Control which goes into the *new* Grinnell Unions. For instance: each union is tested against leakage by applying air pressure under liquid.

High quality materials, completely new, modern manufacturing machinery, and highly skilled personnel are employed in the manufacture of the *new* Grinnell unions. Branch warehouses and distributors, from coast to coast, make local stocks as convenient as your telephone.

Features of the *new* Grinnell bronze-to-iron unions:

- Precision-machined, bronze-to-iron joint for a positive, leak-proof connection
- 100% tested with air under liquid
- Bronze ring inserts of improved design — bonded to iron by newly developed equipment
- True dimension, full depth threads
- Chamfered to protect threads for easy starting
- Designed for rugged service

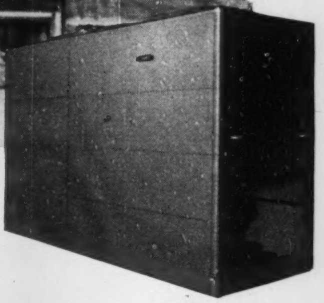
GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports
Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

New York's First "Package" Air Conditioned Office Building Under Construction...



10 USAIRCO DRK's to cool nine-story structure in Long Island City!

The first new multi-story rental office building ever to be fully air conditioned by self-contained central station equipment is now under construction at Queens Plaza, Long Island City, New York.

The building has a 150-foot front, a depth of 85 feet and will contain street floor store space, eight rental office floors and a 1,000 square foot penthouse.

As further proof that factory assembled air conditioning plants are increasing in application, the new nine-story and penthouse building will utilize nine 30-ton USAIRCO dual circuit "Refrigerated Kooler-aire" units (DRK) and one 15-ton DRK. Total cooling capacity is 285 tons.

A 30-ton "package" will be located on each of the nine floors, while the 15-ton will serve the penthouse and one section of the ninth floor. Each unit occupies an enclosed equipment room in the central service core of the structure. All the elements of a built-up system—blower section, compressor section and evaporative condenser—are contained in each unit. By using USAIRCO's packaged air conditioning system, no cooling tower is needed on the roof, freeing the penthouse area for rental income. Extensive condenser water piping and refrigerating piping are also unnecessary.

The ten DRK's—with two compressors and two separate refrigeration circuits—were specified for this particular installation because load variations will require definite capacity control. When outside temperature drops, or when fewer people occupy a floor, just one compressor functions. When temperatures are higher and tenancy increased, full capacity is required and both compressors automatically go into operation. Separate refrigeration circuits permit continued dehumidification when the unit operates at reduced capacity.

Fresh air supply and exhaust air will be handled by two shafts running the entire height of the building. Winter heating will be provided by a baseboard system, supplemented by warm air circulated through the air conditioning system.

Under the owner's plan to lease full floors to individual tenants, metering of the equipment will be possible, because each floor's air conditioning system operates independently. Each tenant will control his own equipment, which will be automatically regulated by wall thermostats.

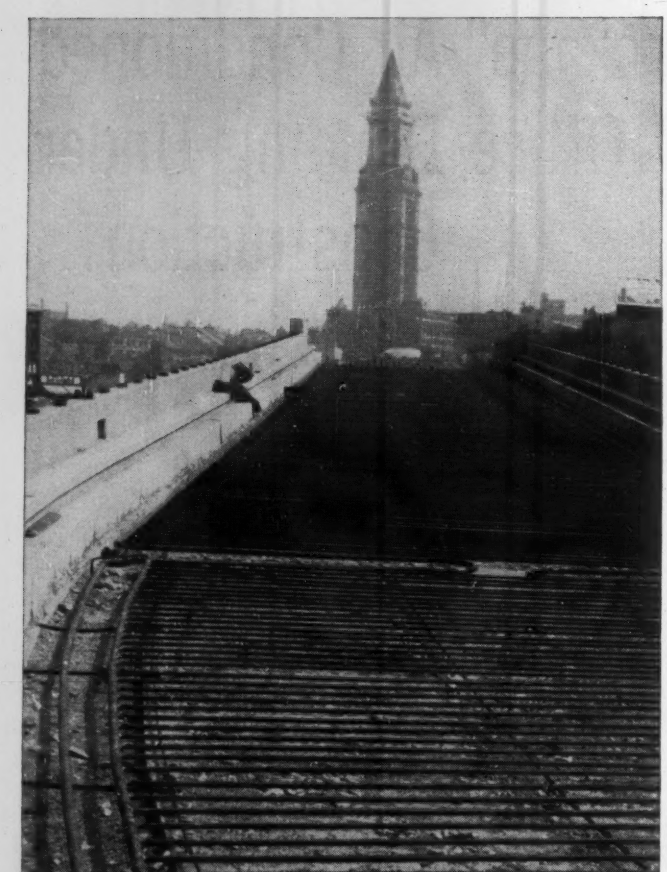
Scheduled for April 1 completion, builder is Depot Construction Corp.; owner, Queens Plaza-Crescent, Inc., both of New York. Wechsler & Schimenti are the architects. J. W. Hubert Corp. is the air conditioning and heating contractor.

usAIRco
30 YEARS OF AIR CONDITIONING

For complete details write Dept. HP-44

UNITED STATES AIR CONDITIONING CORPORATION

MINNEAPOLIS 14, MINNESOTA



World's Largest Snow Melting System Uses Wrought Iron Pipe

More than 200 tons of corrosion-resistant wrought iron pipe forms snow melting grids on sixteen ramps serving Boston's 200-million dollar Aerial Highway

When completed, the access ramps leading to Boston's Aerial Highway will be the modern answer to the winter motorists' dream.

Heated by coils of wrought iron pipe, these pavement ramps will provide a dry road surface in blustery cold weather months to protect the motorists from dangerous skidding hazards and the driving threat of winter traffic jams.

More than 200 tons of wrought iron pipe, selected because of its ability to resist corrosion and vibration, and its ease of installation, are arranged in series and buried in the concrete. To operate, steam supplied by Boston Edison Company, is fed to heat exchangers. Water mixed with Ethylene-Glycol anti-freeze, is circulated through the heat exchangers and wrought iron pipe network. The heated pavement melts snow as it falls, prevents ice from forming.

This modern expressway, designed by Architects-Engineers Fay, Spofford & Thorndike and the Commonwealth of Massachusetts Bridge Department, again reflects Boston's leadership in adapting snow melting systems to winter weather problems. The Merrill Company were Heating Contractors, and the V. Barletta Company were General Contractors. The Jarvis Engineering Company fabricated all pipe coils for the snow melting system.

Wrought iron pipe is establishing durability records in snow melting systems under sidewalks, store entrances, factory platforms, garages, hangers, and other surfaces where snow and ice create safety and production hazards. For complete details, write for our bulletin, WROUGHT IRON PIPE FOR SNOW MELTING SYSTEMS.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Dept.: New York, N.Y.

BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON

WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

Heating Piping & Air Conditioning

Vol. 26 No. 4

(with which is merged the Aerologist)

DESIGN, INSTALLATION, OPERATION AND MAINTENANCE IN INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND PUBLIC BUILDINGS

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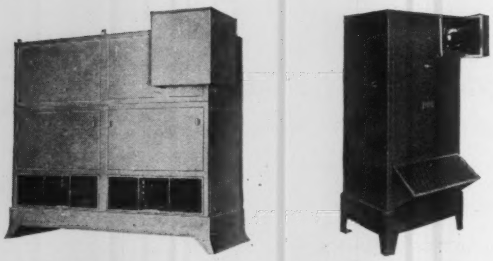
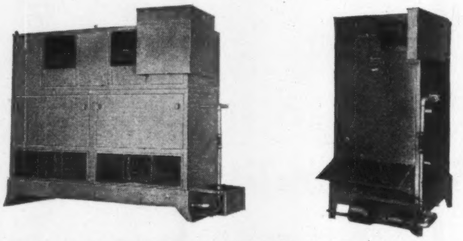


COOLING TOWERS—Air Conditioning, Refrigeration, or Industrial Applications. Outdoor-Indoor. 3 to 75 Tons. Catalogs No. CT-1 and KT-2.



EVAPORATIVE CONDENSERS—Indoor-Outdoor. 3 to 75 Tons. Catalogs No. EC-1 and EK-3.

KENNARD *Engineered*

AIR CONDITIONING EQUIPMENT

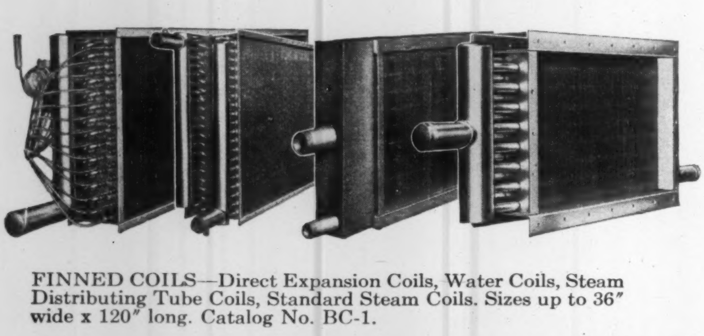
KENNARD
Corporation
its in the fin and the fin is in the tube
PAT. Applied For

Direct Expansion
Freon 12-22
SHELL AND TUBE LIQUID CHILLERS

Kennard research leads the field with this New and Revolutionary Liquid Chiller.

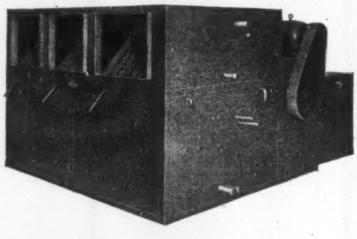
- ★ Internally finned tube.
- ★ Downward feed of refrigerant and oil.
- ★ Guaranteed oil return.
- ★ Controlled refrigerant distribution.
- ★ No freon head gasket.

Sizes 2 to 200 tons *Write for Catalog LC-1.*

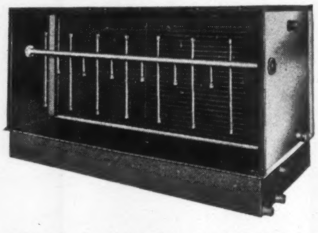


FINNED COILS—Direct Expansion Coils, Water Coils, Steam Distributing Tube Coils, Standard Steam Coils. Sizes up to 36″ wide x 120″ long. Catalog No. BC-1.

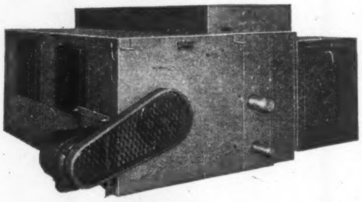
Write for name of nearest representative and catalogs needed.



MULTI-ZONE UNITS—Sizes up to 36 sq. ft. Cooling Coil Face Area. Catalog MZ-1.



SPRAYED COIL DEHUMIDIFIERS—56 Sizes. Coil Face Areas to 81 sq. ft. Catalog No. SC-1.



HEATING AND VENTILATING UNITS—Air Volumes 300 to 28,800 CFM. Catalog No. HV-1A.

AIR CONDITIONING BLOWER UNITS—13 Sizes. 300 to 21,600 CFM. Horizontal or Vertical. Catalog No. AC-1.

KENNARD CORPORATION • 1817 S. HANLEY ROAD
ST. LOUIS 17, MO., U.S.A.

Here's Your Proof!

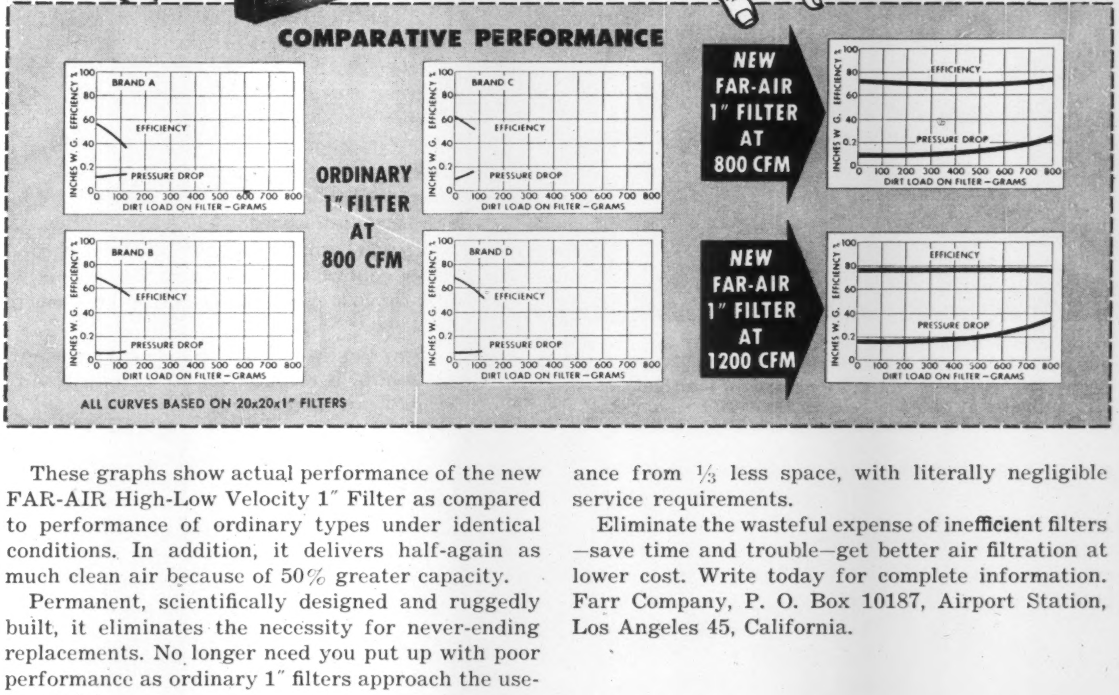
NEW FAR-AIR®

High-Low Velocity 1" FILTER

—holds 7 times as much dirt as ordinary filters

—gives sustained high performance with low pressure loss

—can be used at either high or low velocity



These graphs show actual performance of the new FAR-AIR High-Low Velocity 1" Filter as compared to performance of ordinary types under identical conditions. In addition, it delivers half-again as much clean air because of 50% greater capacity.

Permanent, scientifically designed and ruggedly built, it eliminates the necessity for never-ending replacements. No longer need you put up with poor performance as ordinary 1" filters approach the useless point.

Because it loads progressively, it gives you high efficiency air filtration without critical pressure loss right up to cleaning time. Cleaning is simple and easy. With reasonable care it will last indefinitely.

Here at last is the new-type filter all industry has been waiting for. It means higher quality performance from ⅓ less space, with literally negligible service requirements.

Eliminate the wasteful expense of inefficient filters—save time and trouble—get better air filtration at lower cost. Write today for complete information. Farr Company, P. O. Box 10187, Airport Station, Los Angeles 45, California.

ORIGINATORS OF FAR-AIR CERTIFIED FILTER SERVICE

FARR COMPANY

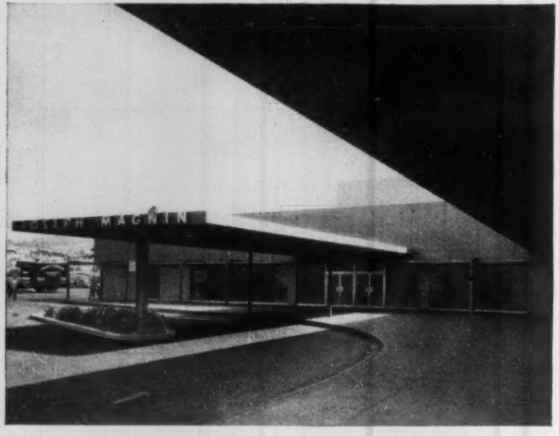
NO COMPROMISE ON QUALITY

Los Angeles, New York, Chicago, Memphis

MANUFACTURED UNDER LICENSE BY FARR COMPANY MANUFACTURING LTD., MONTREAL, CANADA

Better by FARR — Better buy FARR

The comfort problem in a large department store such as the Emporium above is quite different from, say, a small shop. Crowds change greatly in size; department needs vary. But Honeywell Customized Temperature Control easily meets the comfort problems in a wide variety of Stonestown shops.



Inviting modern exteriors, as this view shows, are an important part of Stonestown's customer appeal. Generous overhang provides shelter from rain and sun. Interiors of all buildings provide the finest of comfort—because Honeywell Customized Temperature Control is on the job everywhere at Stonestown.

Inside the medical center (above) you'll find a Honeywell thermostat in every suite or office. This means patients and guests can enjoy *individual* comfort—truly a customized feature that can't fail to please everyone who works in or visits Stonestown.

How Honeywell Customized Temperature Control helps provide

Better business weather for your clients

Why Honeywell Customized Temperature Control is becoming a "must" in all types of buildings

THE state of *Business,* with a capital "B", depends on a multitude of varying factors. But to an important extent, the state of business of a particular client of yours depends on the kind of service he offers—and *how* he offers it.

Take, for example, the Stonestown Shopping Center in San Francisco. All aspects of sound shopping center construction and procedure have been carefully adopted.

Important among these is "indoor weather". Its proper control means a lot to the people who work for your clients—and to those who buy from them, too.

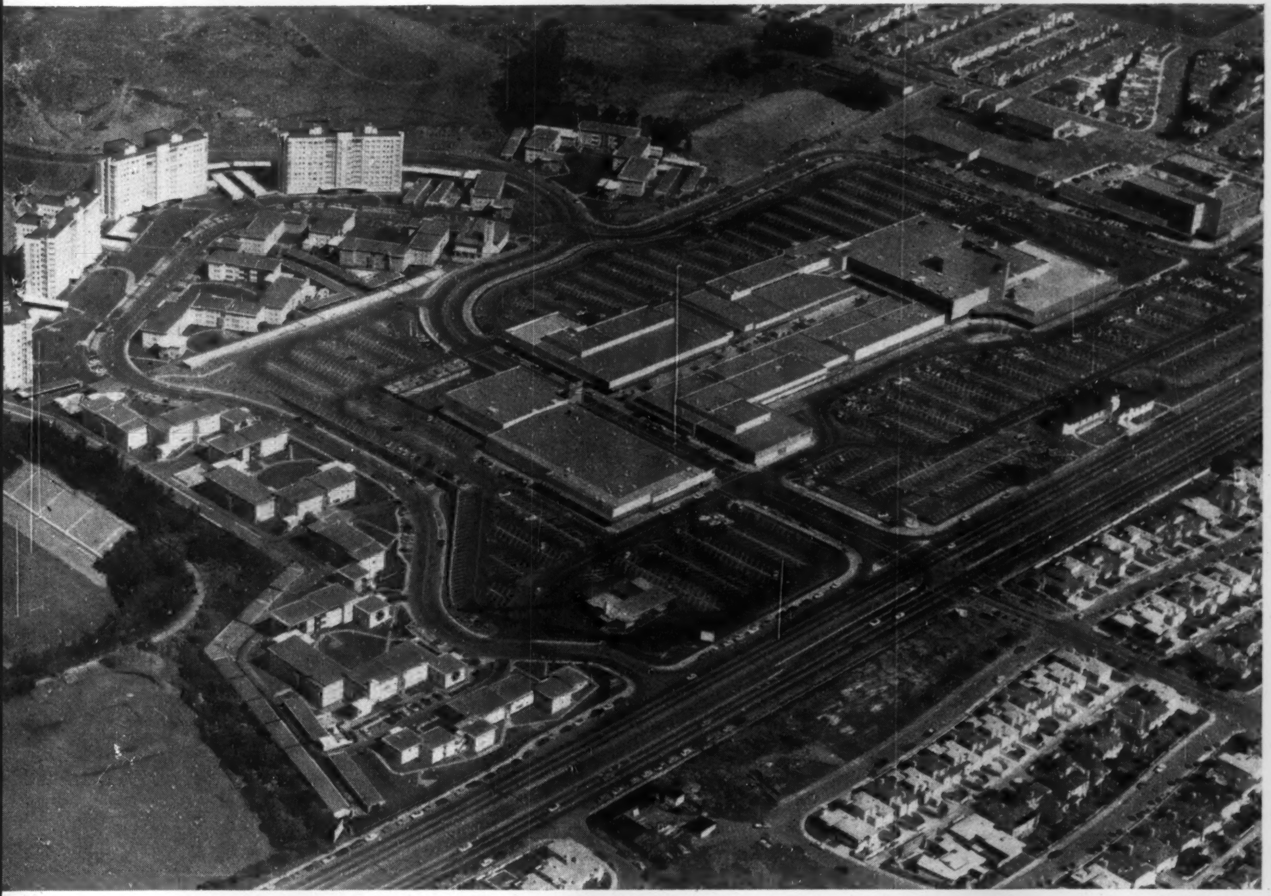
Today the best way to provide proper temperature control is through the use of *Honeywell Customized Temperature Control.*

The key word here is "customized." It means that whatever your clients' control requirements, a Honeywell Customized Temperature Control installation *designed to fit the needs of the building and its occupants is your answer.* This applies not only to heating and cooling, ventilating and humidity control but to industrial control as well.

Only Honeywell can provide true "customized" control. Because only Honeywell manufactures all three types of controls—pneumatic, electric and electronic.

The story, in brief form, of the Honeywell Customized Temperature Control installation in the Stonestown Shopping Center is told here.

The *techniques* used, applied to your particular problems, can help you give your clients the "indoor weather" they've always wanted.



Aerial view of Stonestown, the big regional shopping community in suburban San Francisco. Center includes apartments you see above as well as shopping facilities. Architects: Welton Becket & Associates, Los Angeles. Engineers: Hillberg, Byler and Hengstler, Los Angeles; Deane & Hill, San Francisco.

For comfortable, even temperature in new or existing buildings –of any size–specify Honeywell Customized Temperature Control

Whether it's a shopping center, factory, office, motel, hospital, school—or any size building—new or existing, Honeywell Customized Temperature Control can help meet your clients' heating, ventilating, air conditioning and industrial control problems.

Your clients will not only enjoy more comfort and efficiency, they'll save fuel, too.

For full facts on Honeywell Customized Temperature Control, call your local Honeywell office. Or mail the coupon today.

MINNEAPOLIS Honeywell

H HONEYWELL First in Controls

112 OFFICES ACROSS THE NATION

Henry Stoneson, community builder,
president of Stoneson Development Corporation,
owners of Stonestown Shopping Center, says:

"We believe Stonestown, a "City Within A City", is one of the most pleasant in the world for the shopper. Important in helping make possible this comfort is our Honeywell Customized Temperature Control installation."

MINNEAPOLIS-HONEYWELL REGULATOR CO.
Dept. HA-4-82, Minneapolis 8, Minnesota
Gentlemen: I'm interested in learning more about Honeywell Customized Temperature Control.

*Name*____________________

*Firm Name*____________________

*Address*____________________

*City*__________ *Zone*____ *State*__________

exceptionally low moisture content

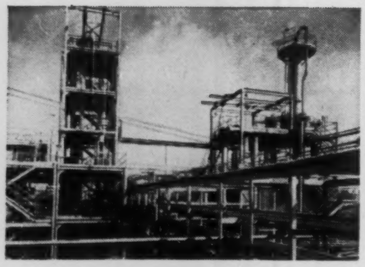
Here's the story about "genetron"® REFRIGERANTS

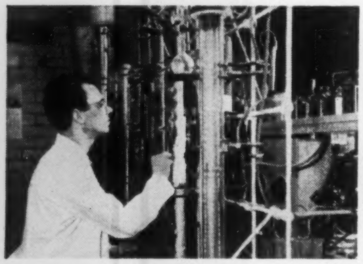
The most important things to be sure of in the refrigerants you use are these: that their moisture content is *always* extremely low . . . that their overall purity *always* meets strict refrigeration standards . . . and that this high quality is *always* maintained, cylinder after cylinder—ton after ton.

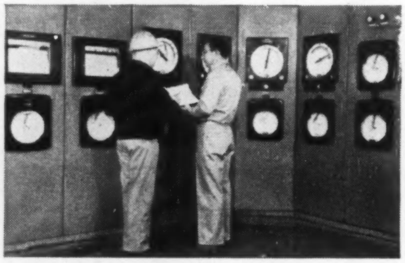
You can rely on "Genetron" refrigerants to measure up on every count—every time . . . and here's why!

First, because General Chemical has over five decades' experience making chemicals of unusually high purity for science and industry . . . actually supplies over 1,000 "precision products" that are certified to meet stringent specifications of America's scientific laboratories.

Second, because General Chemical is a pioneer and leading producer of fluorine compounds, the basic chemicals from which "Genetron" refrigerants are made. That means we *know* the materials behind organic fluorine refrigerants, how to handle them and


Production capacity of General's large new "Genetron" plant is now being tripled—enabling the company to supply industry's future needs most effectively.


"Genetron" refrigerants are products of General Chemical's extensive fluorine research program which has developed over 90 products for science and industry.


The special process used to make "Genetron" refrigerants employs advanced techniques and control methods that assure the exceptionally low moisture content of "Genetron" refrigerants.

outstanding purity

in a nutshell

build into them all the qualities required for use in today's refrigeration and air conditioning equipment. It means we have the mines, raw materials, the equipment and experience to serve the industry's needs effectively now—and in the future.

Third, because "Genetron" refrigerants are made by a special new modern process that guarantees exceptionally low moisture content and outstanding purity in every pound . . . and every ton of "Genetron."

That's the story of "Genetron" refrigerants "in a nutshell"!

. . . That's why you can be confident of getting the finest made, when you order "Genetron" refrigerants!

Always Ask for "Genetron" Refrigerants

For dichlorodifluoromethane—insist on "Genetron" 12 . . . for trichloromonofluoromethane, always ask for "Genetron" 11.

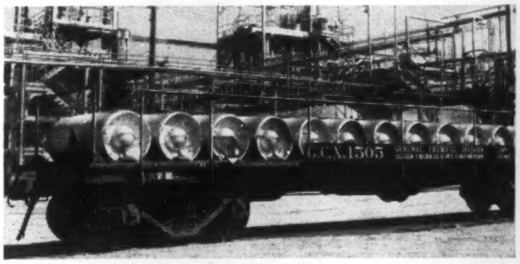
genetron 11

TRICHLOROMONOFLUOROMETHANE

genetron 12

DICHLORODIFLUOROMETHANE

"Genetron" 12 and "Genetron" 11 are identical and interchangeable in all respects with dichlorodifluoromethane and trichloromonofluoromethane produced by any manufacturer meeting the same high refrigerant standards.



Out of the laboratory . . . from our vast sources comes

Purity by the Carload

For Further Information...

Write or 'phone the nearest General Chemical office listed below. Ask for FREE TECHNICAL SERVICE BULLETIN 11.12A on "Genetron" Refrigerants.

Allied Chemical

Products of

GENERAL CHEMICAL DIVISION

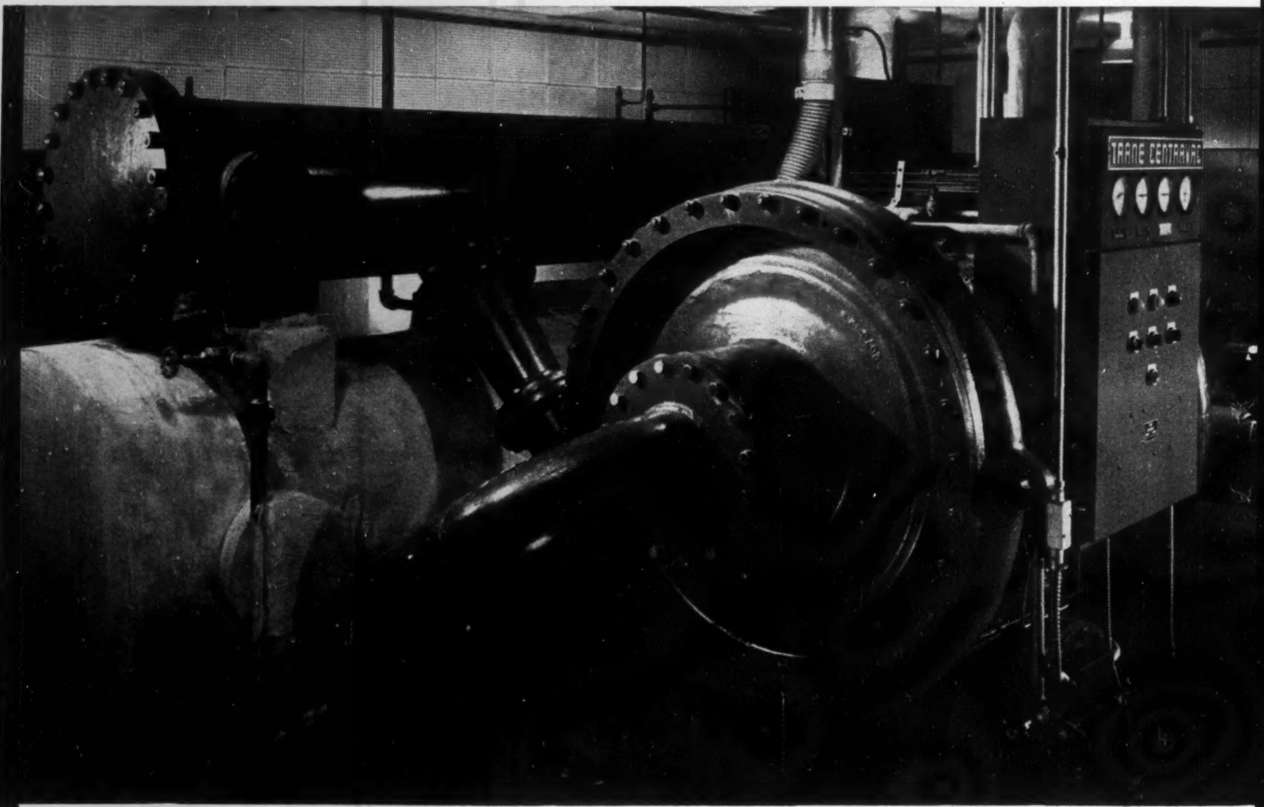
ALLIED CHEMICAL & DYE CORPORATION

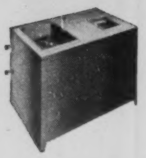
40 Rector Street, New York 6, N. Y.

Offices: Albany • Atlanta • Baltimore • Birmingham • Boston • Bridgeport • Buffalo Charlotte • Chicago • Cleveland • Denver • Detroit • Greenville (Miss.) • Houston Jacksonville • Kalamazoo • Los Angeles • Minneapolis • New York • Philadelphia Pittsburgh • Providence • San Francisco • Seattle • St. Louis • Yakima (Wash.)
In Wisconsin: General Chemical Company, Inc., Milwaukee
In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver

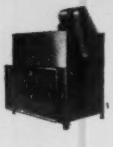
Now...Trane CenTraVac in for your larger

New hermetic centrifugal compressors boost water chilling equipment in new sizes and types provides

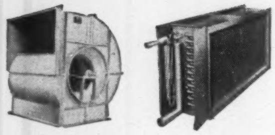




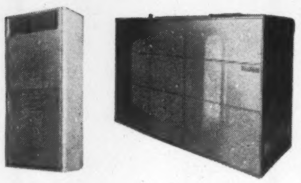
Trane Evaporative Condenser. Use where water is scarce or expensive. Cuts water consumption as much as 90%.



Trane Multi-Zone Climate Changer. Air conditions up to 6 zones at once — each zone can have different conditions. 450 to 23,400 cfm.



Trane Fans and Coils. Fans, Class I and II, backwardly inclined or forward curved. Coils for steam, hot water, cold water or direct expansion refrigerants.



Trane Self-Contained Units. 3 to 20 tons. Heating coil optional. Built-in evaporative condenser optional with 10, 15, 20-ton units.

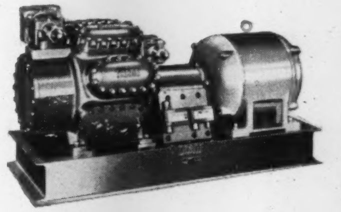
3 new sizes
air conditioning jobs!

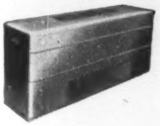
capacity up to 400 tons . . . Other Trane air conditioning increased design flexibility

CenTraVac Water Chiller in 3 new sizes tops the list of TRANE air conditioning equipment that has been widened again to enable you to design more efficiently, more economically than ever! CenTraVac single-unit capacities now range from 45 to a maximum of 400 tons. Hermetic centrifugal refrigeration unit completely self-contained. Starts, stops, modulates automatically. Lets you design systems that adjust automatically to varying cooling needs with power savings almost directly proportional to load variations. Requires no special bases.

4 New Cold Generator sizes—30, 60, 75 and 100 tons—expanded line now provides water chilling capacities from 10 to 100 tons. Complete refrigeration cycle . . . factory engineered, assembled, tested, guaranteed. A single unit, wired, piped and refrigerant-charged. Includes condenser, refrigerant piping, liquid cooler, control valves, motor and accessories. Only simple plumbing and electrical hook-up required.

3 New Reciprocating Compressor units—60, 75 and 100 tons—extend the line from 10 to 100 tons. TRANE compressors are smoother, quieter, longer-lasting. Maximum performance in minimum space. Direct drive. Factory-assembled. Easy to install. Automatically modulate capacity to match variations in cooling demand, slash power consumption. Available with shell-and-tube condenser.





Trane UniTrane room units use chilled or hot water. Individual control. Free-standing, recessed or ceiling models.

What kind of system are you planning? Large . . . small? Simple, complex? Cooling only or a complete air conditioning installation? Enjoy advantages of undivided responsibility and a single source of supply by specifying TRANE equipment. Before you plan your next job, get all the facts on complete TRANE line. Contact your TRANE Sales Engineer or write TRANE, La Crosse, Wis.

one source
one responsibility...

TRANE

The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton, Penn. • Trane Co. of Canada, Ltd., Toronto
87 U.S. and 14 Canadian Offices.

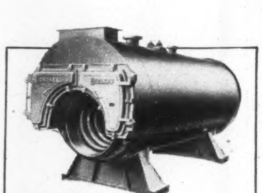
MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

What the BIG TRUTH* and KEWANEE reserve plus rating mean to the jobber-contractor . . .

■ Once in a great, great while an industry announcement has significance far beyond the usual. We at Kewanee-Ross believe the Big Truth about boilers and Kewanee Reserve Plus rating to be one of the most important precepts of business we ever presented.

Kewanee Reserve Plus rating *guarantees* dependability, flexibility, higher efficiency, lower costs, longer boiler life because it means "cruising speed" operation. So when you consider boilers, remember the Big Truth*. . . ***"you will make more money selling boilers rated on nominal capacity to operate at 'cruising speed' because you'll never have to 'make good' a failure."***

Kewanee Reserve Plus means boiler selection is made with confidence, guesswork is eliminated . . . the most economically sound expenditure is guaranteed . . . protection against emergencies and fluctuating loads, provision for expansion are provided . . . lower boiler maintenance and lower operating costs are assured.

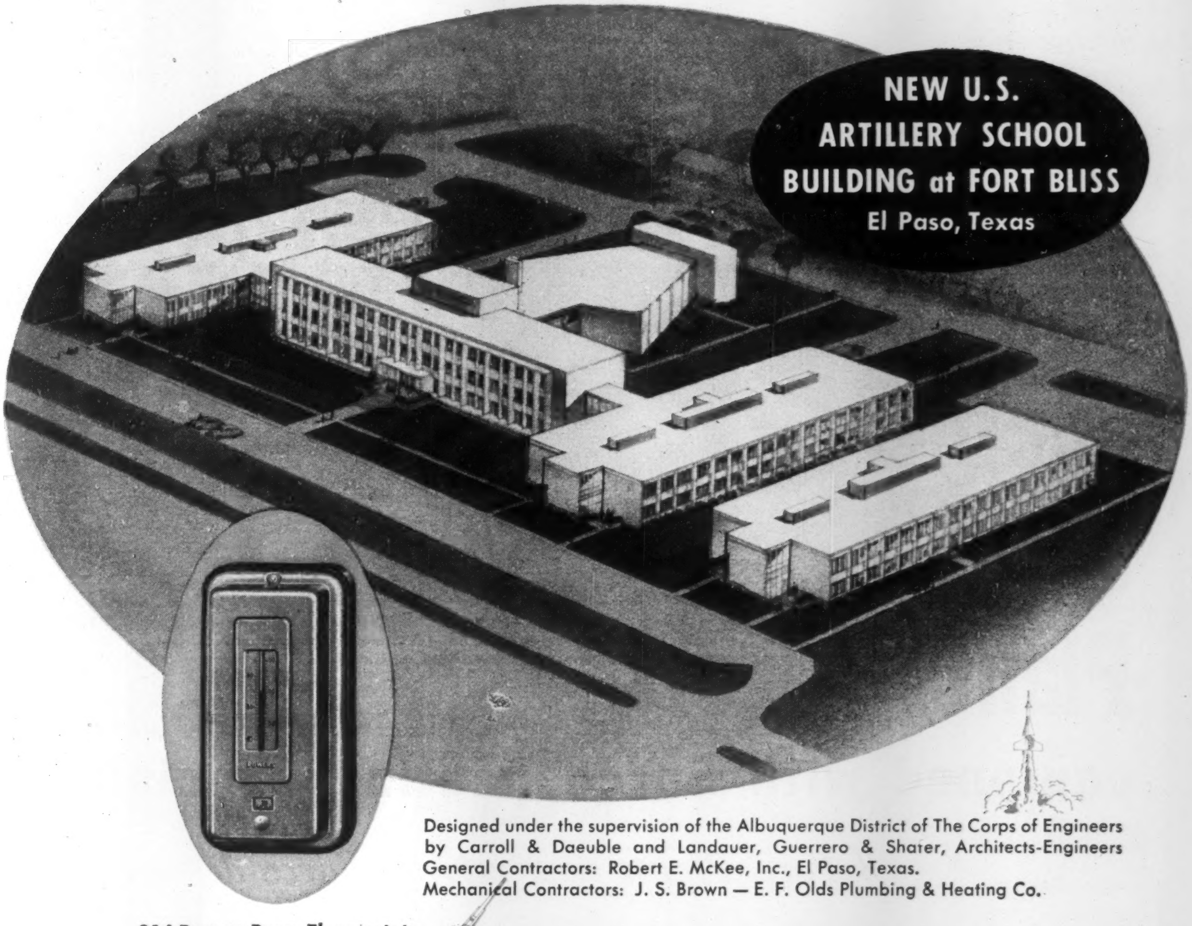


M-800 Series

Write for **FREE** booklet on how to save thousands of dollars on boilers

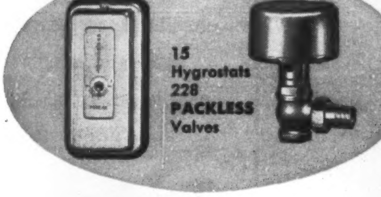
You can count on KEWANEE engineering

KEWANEE-ROSS CORPORATION • KEWANEE, ILLINOIS
Division of American Radiator & Standard Sanitary Corporation
Serving home and industry • American-Standard • American Blower
Church Seats & Wall Tile • Detroit Controls • Kewanee Boilers
Ross Exchangers • Sunbeam Air Conditioners

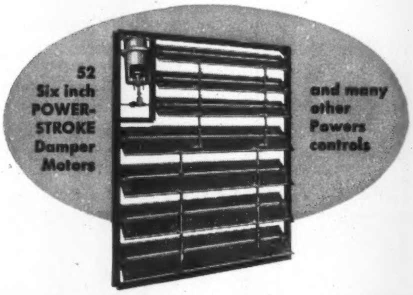

NEW U.S.
ARTILLERY SCHOOL
BUILDING at FORT BLISS
El Paso, Texas

Designed under the supervision of the Albuquerque District of The Corps of Engineers by Carroll & Daeuble and Landauer, Guerrero & Shater, Architects-Engineers
General Contractors: Robert E. McKee, Inc., El Paso, Texas.
Mechanical Contractors: J. S. Brown — E. F. Olds Plumbing & Heating Co.

214 Powers Room Thermostats
Used here.


15
Hygrostats
228
PACKLESS
Valves

Powers **PACKLESS** Control Valves eliminate packing maintenance, leakage of water, steam or loss of vacuum


52
Six inch
POWER-
STROKE
Damper
Motors
and many
other
Powers
controls

POWERS

Pneumatic System of TEMPERATURE and HUMIDITY Control

Selected for ANTI-AIRCRAFT and GUIDED MISSILES Branch of the Artillery School

TAXPAYERS will derive a big return from their investment in this huge academic building. From it will come increased strength for our defenses to hurl back and defeat aggression.

Proper temperature for maximum comfort and efficiency will be maintained in all classrooms, auditorium and administrative facilities by a Powers control system.

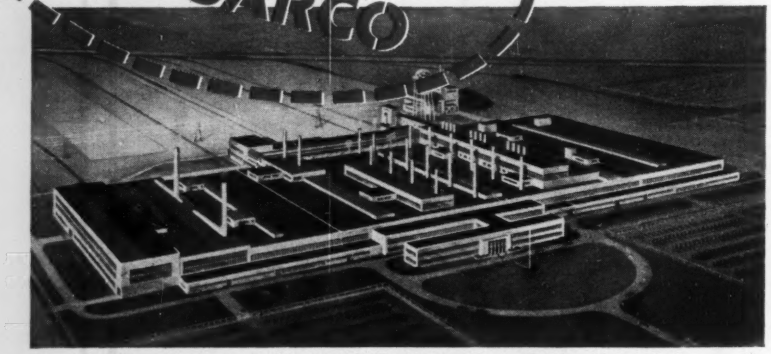
With over 60 years of experience, a modern complete line of controls for heating, air conditioning and industrial processes—POWERS is well qualified to help with your temperature and humidity control problems.

(b48)

Established in 1891 • THE POWERS REGULATOR COMPANY • SKOKIE, ILL. • Offices in Over 50 Cities

The most convincing stamp of user satisfaction →

ANOTHER REPEAT ORDER FOR SARCO



Ford Foundry, Cleveland. *Architects and Engineers:* F. A. Fairbrother and George H. Miehls. *Consultants.* Albert Kahn Associated Architects and Engineers, Inc., Detroit. *Heating Contractors:* Smith and Oby Co., Cleveland.

now another Ford Plant

equipped with Sarco heating specialties

8 Ford Plants now rely on Sarco dependability

To get repeat business it takes more than just promises of product performance . . . *it takes proof.*

For the past fifteen years Sarco product performance has been proved seven times over to the Ford Motor Company. Now the new Cleveland Foundry is the eighth Ford plant to be equipped with Sarco Heating Specialties. Over 7,000 steam traps, strainers, radiator valves and traps and other Sarco Specialties give dependable, efficient service in all eight plants.

Doesn't this repeat business speak for itself?

Specify Sarco Heating Specialties on your next job and be assured of complete customer satisfaction. Full details of all Sarco products are available on request.

Other SARCO-EQUIPPED plants of the Ford Motor Company

DEARBORN, MICHIGAN, *Ford Styling Building*
CLEVELAND, OHIO, *Engine Plant*
WAYNE, MICH., *Lincoln-Mercury Assembly Plant*
BUFFALO, N. Y., *Ford Stamping Plant*
DALLAS, TEXAS, *Ford Assembly Plant*
KANSAS CITY, MISSOURI, *Ford Aircraft Plant*
METUCHEN, NEW JERSEY, *Lincoln-Mercury Assembly Plant.*

Here's why so many architects, engineers and heating contractors specify and install Sarco

—job after job.

- **Proven dependability**
- **Trouble-free service**
- **Complete line from one reliable manufacturer**
- **Nationally known and preferred**

SARCO **SAVES STEAM**

SARCO COMPANY, INC., Empire State Building, New York 1, N. Y.
Sarco Canada, Ltd., Toronto 8, Ontario . . . Represented in Principal Cities

STEAM TRAPS • TEMPERATURE CONTROLS • HEATING SPECIALTIES

Radiator Valves • Traps

Strainers

Float-Thermostatic Traps

Inverted Bucket Traps

Thermostatic Traps

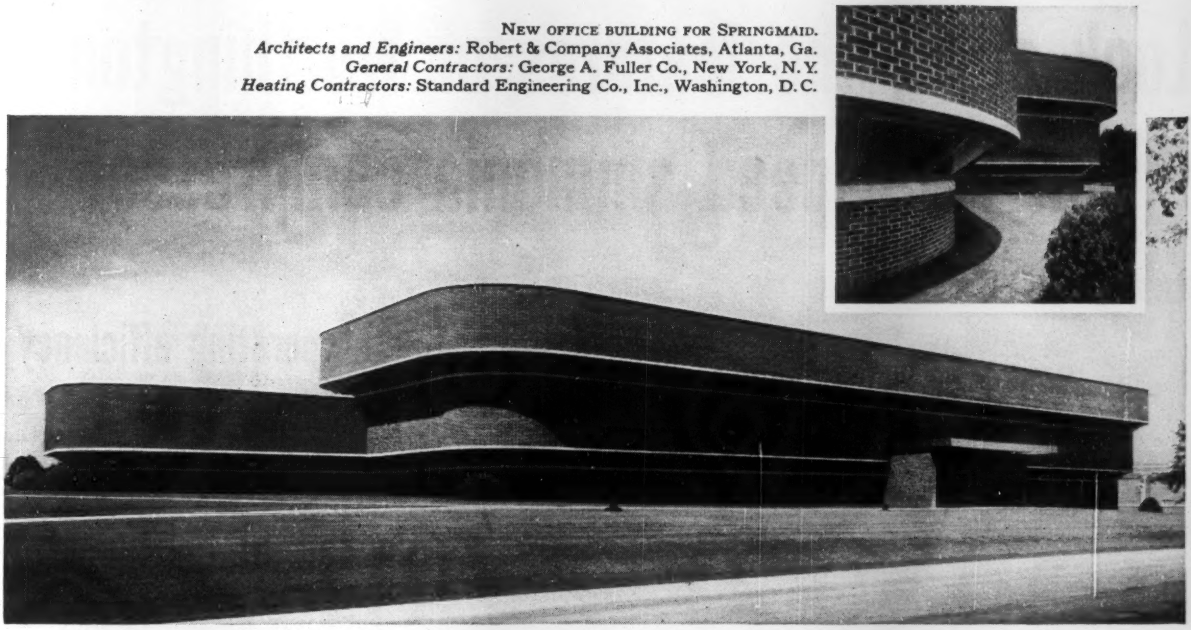
Water Blenders

Air Eliminators

Dial Thermometers

Self-Operated Temp. Reg.

New office building for Springmaid.
Architects and Engineers: Robert & Company Associates, Atlanta, Ga.
General Contractors: George A. Fuller Co., New York, N. Y.
Heating Contractors: Standard Engineering Co., Inc., Washington, D. C.



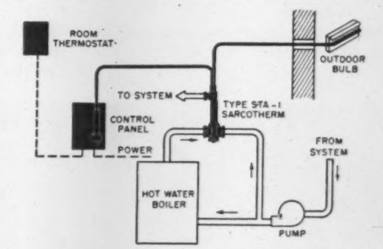
SARCOTHERM *Controls Radiant Heating System in Springmaid's Unique Home Office*

Upside-down windows, "floating" ceilings, and radiant heated walls tell the story of Springs Cotton Mills' remarkable new building in Fort Mill, S. C.

Sarcotherm weather modulated controls were specified for the building's unusual heating system which operates through radiant panels installed in the walls. The system is divided into seven zones, each of which is regulated by a Sarcotherm Indoor-Outdoor control. Thus each zone is assured comfort regardless of location and outside temperature conditions.

Sarcotherm provides a simple, low-cost way of achieving accurate, sensitive control of radiant and hot water heating systems. Coupled to these distinct advantages is Sarcotherm's extensive engineering service which can help you design and install the most efficient and trouble-free system possible.

A Sarcotherm heating engineer will be happy to talk over your next project with you. For complete details on Sarcotherm weather modulated controls contact your nearest Sarcotherm representative, or write direct to Sarcotherm Controls, Inc., Empire State Building, N. Y. 1, N. Y.



Typical of the Springmaid installation is this hookup. Proportioning type mixing valve continuously modulates water temperatures.

TAKE ADVANTAGE OF SARCOTHERM'S UNUSUAL ENGINEERING SERVICE

In a Class By Itself—Sarcotherm's engineering service begins with the inception of the job, *carries through* every step of the way.

Complete Installation Drawings and Wiring Diagrams—not just general drawings but complete, tailor-made Sarcotherm drawings and diagrams for each individual job.

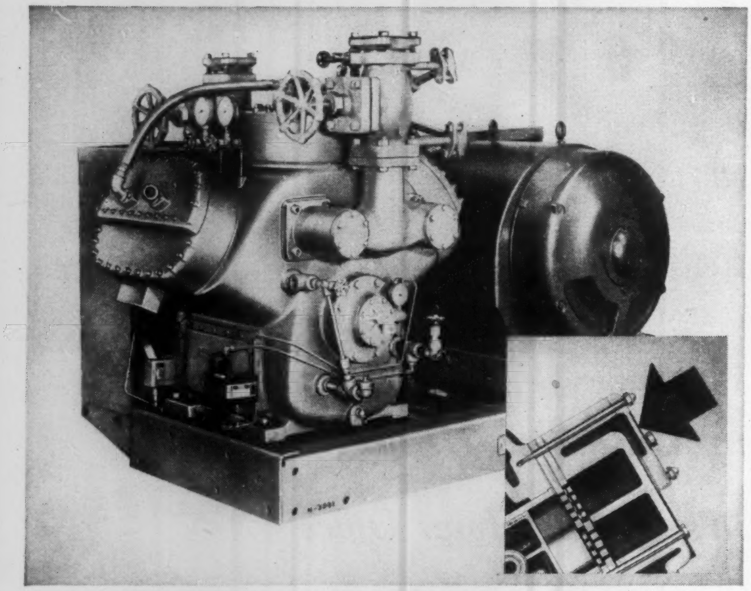
On-the-Job Help—your contractor gets Sarcotherm's full cooperation and technical assistance backed by many years of specialized experience.

SARCOTHERM CONTROLS, Inc.

An Affiliate of SARCO COMPANY, INC.

Weather Modulated Controls for Hot Water, Radiant and Steam Heating Systems

Look at all the features of Worthington's new high-speed ammonia compressor



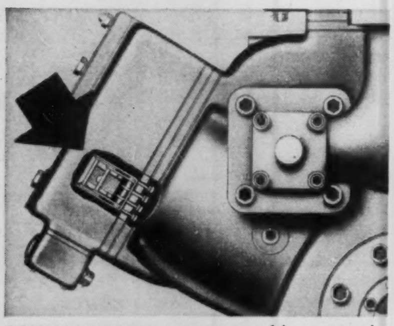
IMPROVED INTERNAL MANIFOLDING—cool suction gas completely surrounds the cylinder walls, providing longer valve life and increased overall efficiency. All passageways between suction discharge and shutoff valves are cast integrally within the crankcase, eliminating outboard fittings. Cross section shows water jacketing on one of the cylinders.

High operating efficiency and lighter weight make this modern unit the talk of the industry

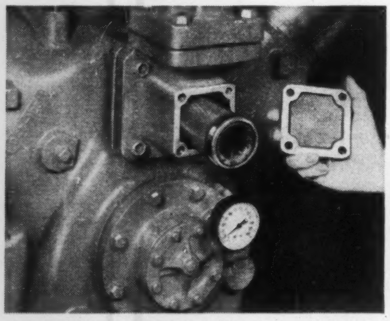
These lightweight, compact Worthington ammonia compressors have the same high operating efficiency and versatility as their lower speed counterparts.

Ranging in capacities from 18 to 150 tons, the new units can be used as high-stage or booster machines.

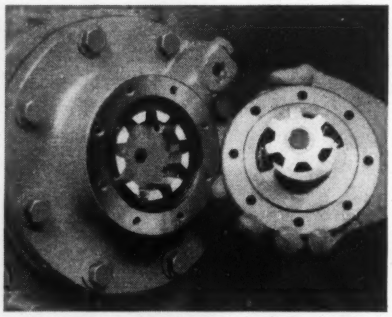
Get in touch with your nearest Worthington district office for more facts about these rugged compressors. Or write to Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.3.56, Holyoke, Mass.



ELECTRIC UNLOADING—a new achievement in variable capacity control. You can start compressor with a normal torque motor; power consumption is automatically balanced against load. Separate unloader units allow easy maintenance . . . no oil or gas pressure lines to worry about.



NEW SUCTION MANIFOLD, with cover plate over suction strainer inlet, allows easy removal of the suction gas strainer for cleaning, without disturbing any of the pipes, valves or other parts. The strainer is unique in that it fits entirely within the crankcase manifold, requiring no additional space.



NEW FORCE-FEED LUBRICATION SYSTEM — full pressure, positive lubrication, regardless of rotation. A new rotary oil pump, driven directly by the crankshaft, eliminates complicated and noisy gear trains. Oil is filtered through a strainer in the crankcase for protection of pump and other moving parts.

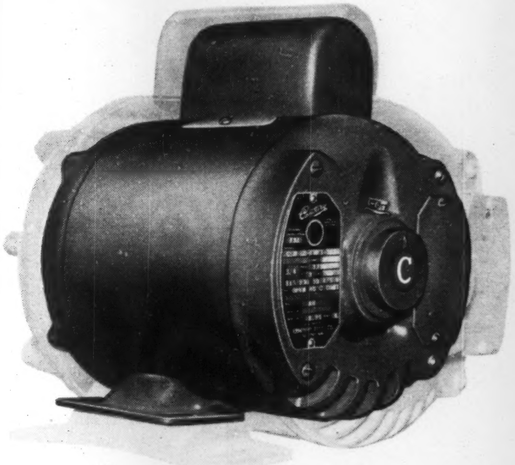
A.3.56

WORTHINGTON

CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME

MORE POWER IN SMALLER FRAMES

SAVE SPACE

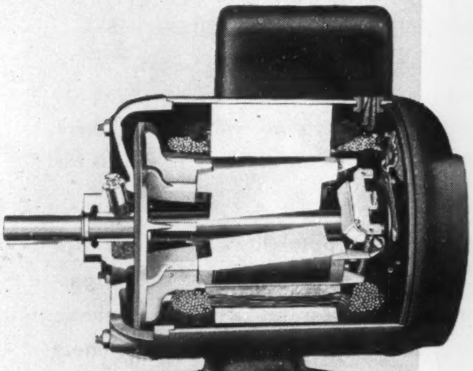


WEIGH LESS

NEW Century Form "F" Fractional H.P. Motors

NOW AVAILABLE IN ⅛ TO ¾ H.P.

Thanks to new techniques developed in the last several years, this *smaller* power package combines improved performance with even greater Century dependability.



Here's What New Techniques Deliver...

1. Better magnetic characteristics for the motor because of more uniform silicon laminated steel in magnetic cores.
2. A high dielectric and increased abrasive resistance qualities result from improved plastic insulated wire in the coils.
3. Important slot space is saved by improved plastic slot insulation. Extremely tough with higher dielectric resistance.
4. Unusual resistance to abrasion, moisture and heat is provided by improved thermal setting plastic varnish insulation on windings.
5. Squirrel cage rotors are more uniform because of improved high-pressure die-cast aluminum rotors. Individually, dynamically balanced.
6. Increased cooling ability is provided by improved ventilation.
7. These new Century Motors incorporate all mechanical features proved effective in thousands of varying applications.

For full details on Century Fractional H. P. Motors—write for bulletin 1-5 Page 1. Century also offers a wide range of types and sizes in AC and DC . . . 1/8 to 400 H. P.

Century C Motors

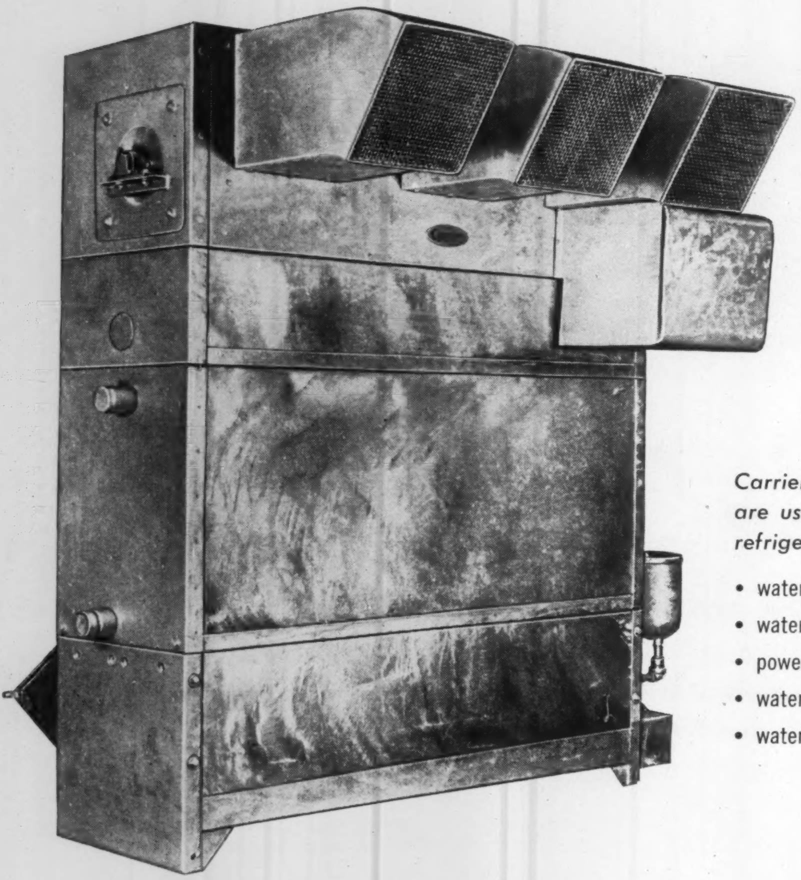
CENTURY ELECTRIC COMPANY, 1806 Pine Street, St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

832

Carrier Evaporative

Prove



Carrier Evaporative Condensers are used with refrigerating compressors where . . .

- water rates are high
- water use is restricted
- power rates are high
- water temperatures are high
- water disposal is inadequate or taxed

You'll find Carrier Evaporative Condensers on rooftops and in basements from coast to coast . . . saving water for a Texas locker storage company . . . cutting electric power costs for a Maryland dairy . . . removing heat for an Arizona department store . . . cooling Diesel jacket water at a northwest power plant.

And everywhere you'll get the same report: "Carrier Evaporative Condensers are rugged!"

Carrier built the *first* evaporative condenser, now builds them in 7 sizes, builds them to *last!*

Heavy-gauge casings are hot-dip galvanized *after* fabrication. Condensing coils are formed from ¾" prime surface steel pipe—spaced to prevent clogging from scale or algae, easy to get at for flushing and cleaning.

Engineers like the adaptability of Carrier Evaporative Condensers to a wide range of refrigerants, condensing pressures and atmospheric conditions. Contractors like their completeness and compactness and the way they are sectionalized for easy installation. Customers like dependable operation, serviceability and extra long life.

For complete details and specifications, call your Carrier dealer. Or write Carrier Corporation, Syracuse, New York.

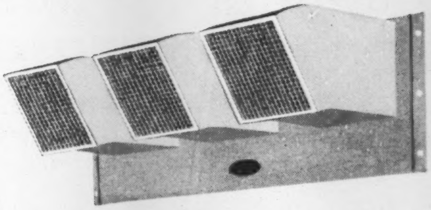
E.-6.—58

Condensers

Their Ruggedness!

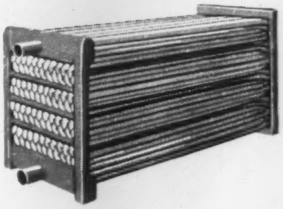
Heavy-gauge casing hot-dip galvanized after fabrication

No chinks in this armor. Each section is formed, welded *then* hot-dip galvanized. Rust and corrosion are sealed out.



Non-clog coils are made of prime surface steel pipe

No fins to become fouled. Rows are spaced to prevent clogging from scale or algae. Available in single or double circuits.

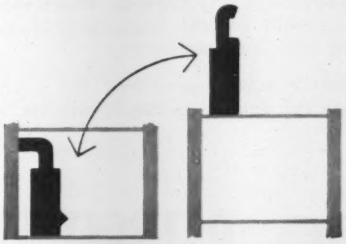


Water treatment unit keeps scale down, efficiency high

Treats recirculated water chemically. Protects against hard scale formation on condensing coils. Maintains full rated capacity of unit.

Completely adaptable, easy to install and easy to service

Can be located indoors or out. Helps exhaust air in basement installations. All sections easily accessible through hinged doors.

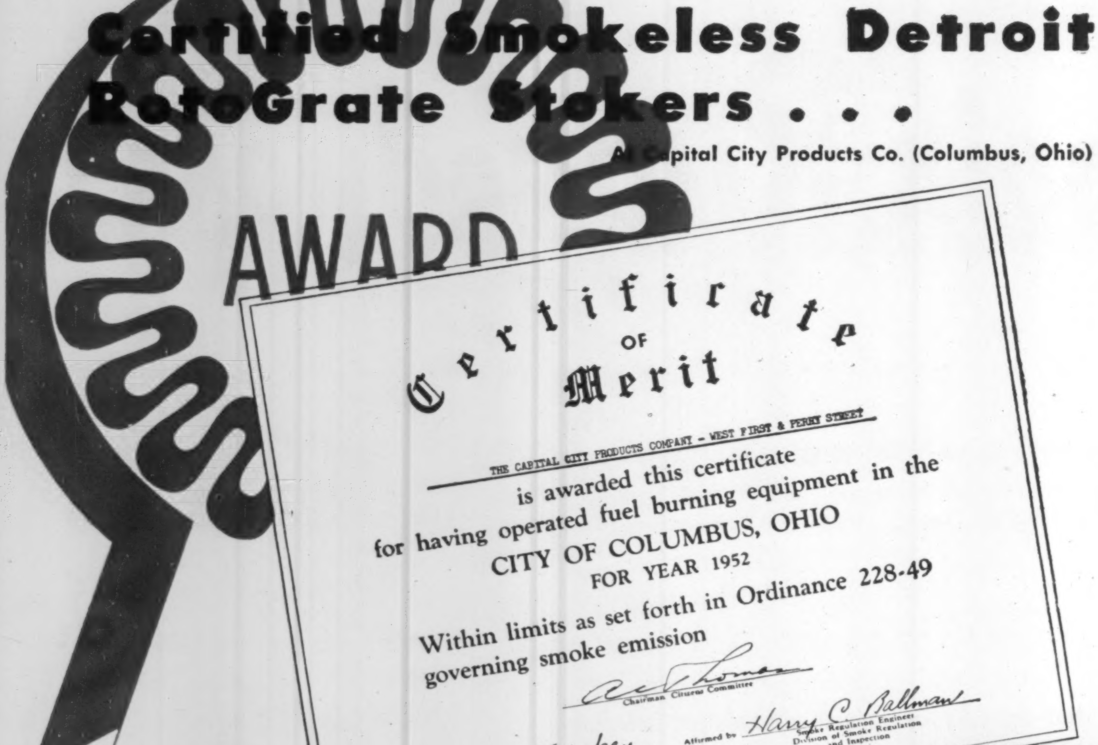


air conditioning · refrigeration · industrial heating

Carrier

Certified Smokeless Detroit RotoGrate Stokers . . .

At Capital City Products Co. (Columbus, Ohio)



Certificate of Merit

THE CAPITAL CITY PRODUCTS COMPANY - WEST FIRST & PERRY STREET

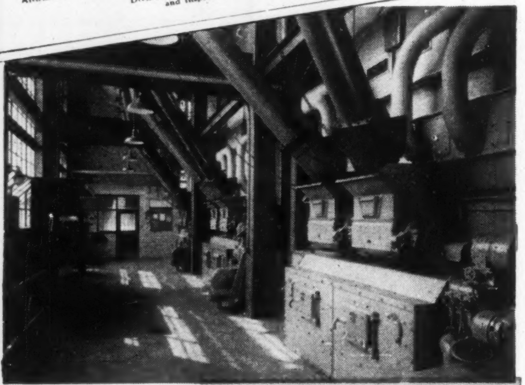
is awarded this certificate
for having operated fuel burning equipment in the
CITY OF COLUMBUS, OHIO
FOR YEAR 1952

Within limits as set forth in Ordinance 228-49
governing smoke emission

A. C. Thomas
Chairman Citizens Committee

Helmar G. Starkey
The Columbus Chamber of Commerce

Affirmed by Harry C. Ballman
Smoke Regulation Engineer
Division of Smoke Regulation and Inspection



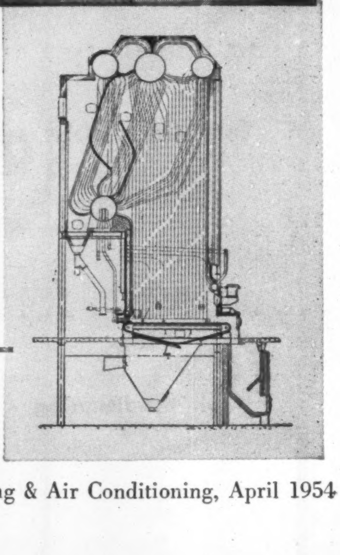
This Detroit RotoGrate Stoker has been certified smokeless by the City of Columbus, Ohio. This certificate awarded by the Citizen's Committee, and affirmed by the Smoke Regulation and Inspection Division is proof of performance.

Detroit RotoGrate Stokers operate without smoke because of their many features of design including precise control of fuel feed, grate speed and air supply.

RotoGrate is a modern spreader stoker with grates that move slowly forward discharging the ash at the front. They burn any type of Bituminous Coal or Lignite . . . handle rapidly fluctuating loads with uniform pressure over long periods.

Have you a smoke problem? Or a problem of fuel cost? Ask for details on the RotoGrate. No obligation.

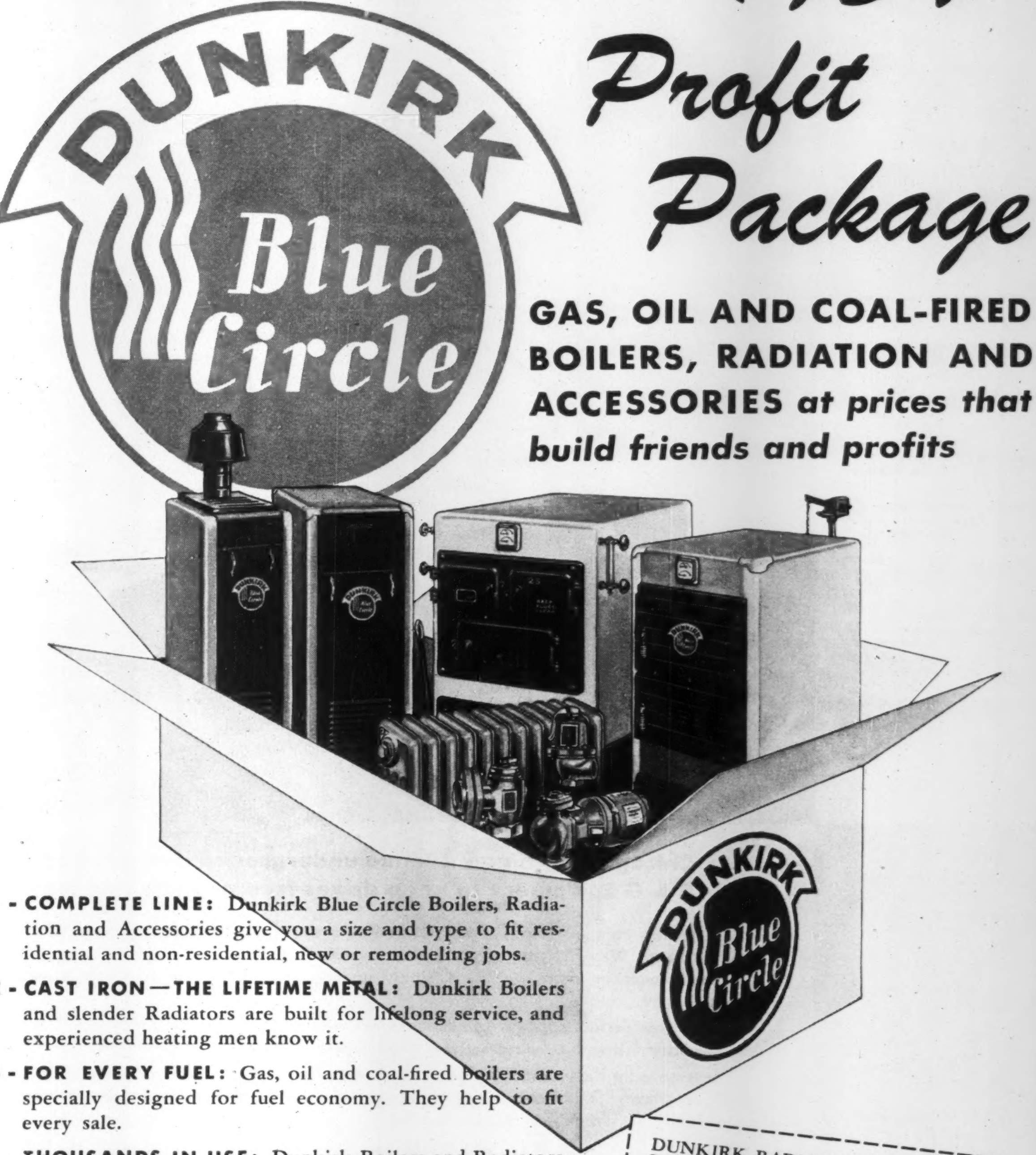
Detroit RotoGrate Stokers in the plant of Capital City Products Company, Columbus, Ohio.



DETROIT STOKER COMPANY

General Motors Building · Detroit 2, Michigan
Works at Monroe, Michigan · District Offices in Principal Cities

HERE IS YOUR HOTTEST *1954 Profit Package*



GAS, OIL AND COAL-FIRED BOILERS, RADIATION AND ACCESSORIES *at prices that build friends and profits*

1 - **COMPLETE LINE:** Dunkirk Blue Circle Boilers, Radiation and Accessories give you a size and type to fit residential and non-residential, new or remodeling jobs.

2 - **CAST IRON—THE LIFETIME METAL:** Dunkirk Boilers and slender Radiators are built for lifelong service, and experienced heating men know it.

3 - **FOR EVERY FUEL:** Gas, oil and coal-fired boilers are specially designed for fuel economy. They help to fit every sale.

4 - **THOUSANDS IN USE:** Dunkirk Boilers and Radiators have made warm friends for men who sell, install and use them.

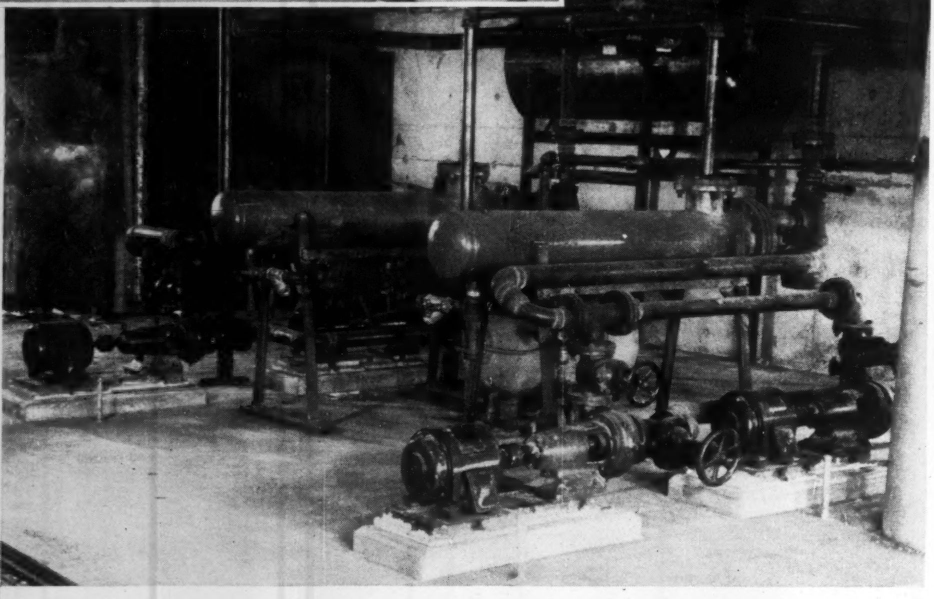
5 - **PRICED TO SELL:** Get the profit story on Dunkirk Boilers, Radiators and Accessories. You will enjoy doing business with Dunkirk.

Mail this Coupon for the Dunkirk Profit Story ➡

DUNKIRK RADIATOR CORP.
Dunkirk, New York.
Send complete details of your 1954 Profit Package.
Name.............................
Concern.............................
Street.............................
City.......................State........

DUNKIRK RADIATOR CORPORATION, DUNKIRK, N. Y.

SNOW MELTING by B&G



CONSULTING ENGINEER:
Ralph H. Burke

GENERAL CONTRACTOR:
John Griffiths & Son Construction Co.

HEATING CONTRACTOR:
M. J. Holleran, Inc.

PLUMBING CONTRACTOR:
Commonwealth Plumbing & Heating Co.

B & G EQUIPMENT INSTALLED IN UNDERGROUND GARAGE

3—CSU STEAM CONVERTORS

●

6—1510 CENTRIFUGAL PUMPS

●

3—3" AIRTROL BOILER FITTINGS

●

3—1" AIRTROL TANK FITTINGS

●

3—NO. 1000 ASME RELIEF VALVES

Chicago's Michigan Avenue underground garage uses B & G Equipment to keep drives free of snow and ice

In the installation above, forced hot water heating is shown in a notable application as a traffic safety measure. Water heated in B & G steam convertors is circulated by B & G pumps through pipe coils under the ramps of Chicago's huge underground garage...assuring safe, unimpeded driving in any weather.

Dependable performance of equipment in an installation of this kind is obviously a prime consideration. There is no surer warranty of such performance than to specify "B & G."

The reasons for the universal acceptance of B & G *Hydro-Flo* Products can be summed up in a single sentence—"Sound engineering backed up by modern manufacturing methods capable of translating good design into fine product."

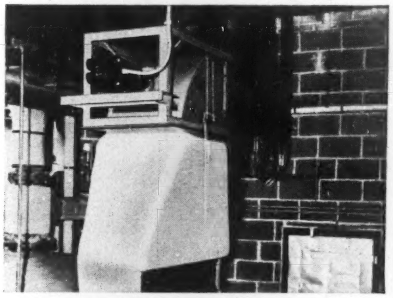
When you specify "B & G" you can be sure that full value will be delivered—in operating economy—in dependability—and in long service.

Hydro-Flo PRODUCTS

For full information on B & G *Hydro-Flo* Products, send for the B & G General Catalog

BELL & GOSSETT COMPANY
Dept. DJ-5, Morton Grove, Illinois
Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Canada

MOTORIZED CHIMNEY DRAFT



with the WING DRAFT INDUCER

No boiler can operate satisfactorily or efficiently over wide ranges of weather or load with variable natural draft. The fuel—whether oil, gas or coal—must have enough oxygen for complete combustion. There must be sufficient draft or furnace fires will be slow burning and lifeless, resulting in uneven, insufficient and irregular heat.

WING Draft Inducers insure positive, adequate, uniform draft regardless of variable weather conditions or inadequate chimney or breeching construction.

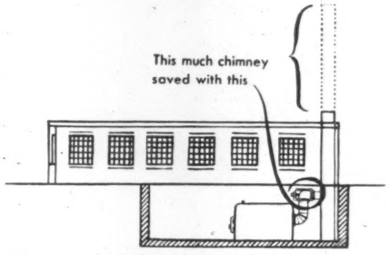
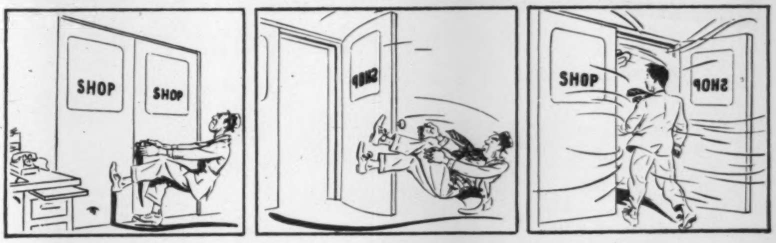


Diagram above shows how much chimney is saved by installing Wing Draft Inducers.

Wing Draft Inducers are suitable for use in connection with oil, gas, stoker-fired or hand-fired heating boilers, industrial furnaces or kilns, or high pressure steam boilers, either stationary or marine. Sizes are available for boilers as low as 1000 sq. ft. E. D. R. up to steam generators producing 100,000 pounds of steam/hr. Special, heavy duty designs available for these larger boilers.

Wing Draft Inducers are made in two types—for insertion in breeching or flue, or for installation on top of a chimney. Write for a copy of Bulletin 1-52 to L. J. Wing Mfg. Co., 140 Vreeland Mills Road, Linden, New Jersey.

Is Your Factory Starved for AIR?



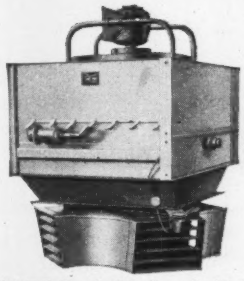
If this is what happens when you go from the office out into the shop, your plant is starved for air! The vacuum created by the operation of necessary exhaust equipment is usually responsible. While our pictures may be slightly overdrawn, something like that may be happening in your plant.

If your building is not new, the vacuum may be relieved by crevices, loose-fitting doors, windows, and open doors which will admit so much unheated air that a great deal of discomfort may be caused and your present heating system will be entirely inadequate.

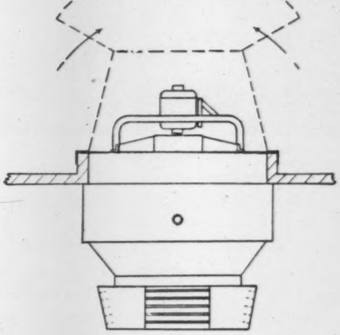
If the building is tight—no excess crackage and no frequently opening doors—the ventilating system which you so painstakingly designed and installed to protect your employees and increase production won't work properly, unless you make special provisions for delivering into the building an amount of warmed air at least equivalent to that which your exhaust system will take out.

There is an easy solution. Install WING FRESH AIR SUPPLY HEATERS with Revolving Discharge Outlets. In winter they bring in fresh air through heating coils varied to just the right temperature, replacing exhausted air. In summer, with the steam turned off, they circulate the air in your plant, giving a cool, refreshing sensation to the workers and keeping production up to normal in stifling weather.

WING FRESH AIR SUPPLY HEATERS



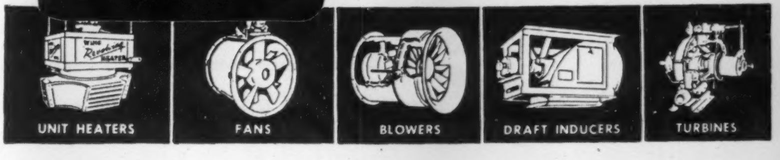
WING Fresh Air Supply Unit with fan enclosed in casing.



(Right) WING Fresh Air Supply Unit with fan above roof line.

Wing

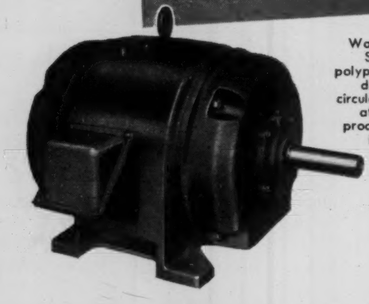
L. J. Wing Mfg. Co. Linden, N. J.
140 Vreeland Mills Road
Factories: Linden, N. J. & Montreal, Canada
In Europe: Etab. Wanson, Brussels, Belgium



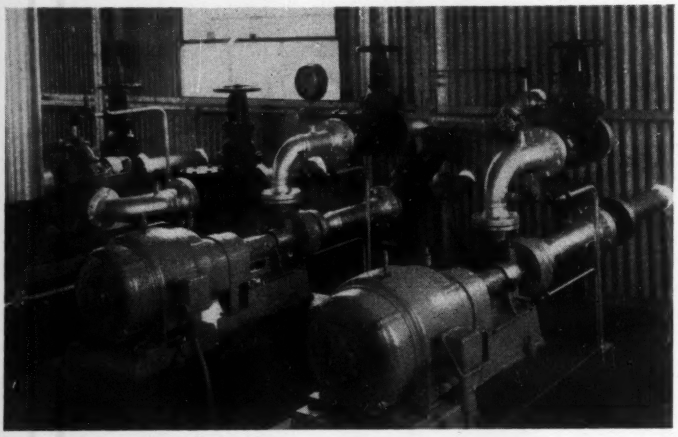
Wagner®
ELECTRIC MOTORS
... the choice of leaders in industry

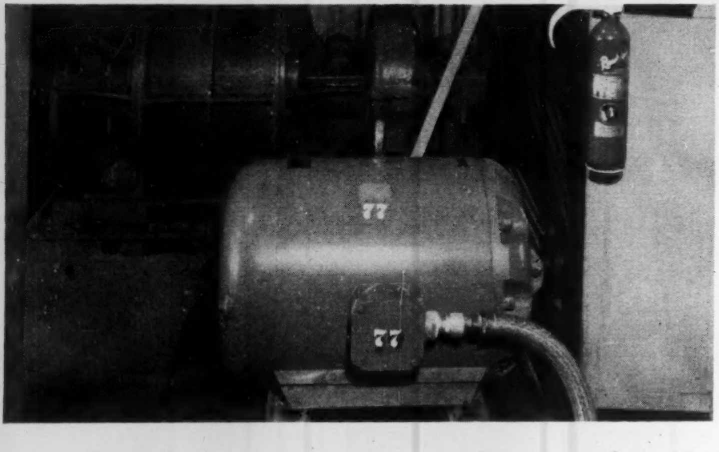
You can *depend* on Wagner Motors to furnish PLENTY OF POWER for your product

PUMPS

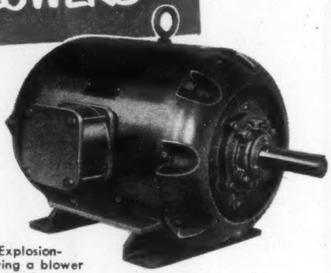


Wagner 15 hp Splash-proof polyphase motors driving water circulating pumps at a large oil processing plant in Louisiana.





BLOWERS



Wagner 40 hp Explosion-proof motor driving a blower to draw grain into a hopper at a Southern brewery.

Motors that drive compressors, pumps and blowers need plenty of electrical and mechanical stamina to hold up under the hard, steady grind demanded by these applications.

Fitting the right motor to such equipment is not a problem of designing and building special motors, but of choosing a standard Wagner Motor suited to the job. Wagner Motors are diversified in design and can be readily adapted to a wide range of compressor, pump and blower applications. Improve the performance, economy, and dependability of your product by choosing Wagner Motors as standard equipment.

Bulletin MU-185 gives information on the complete line. Let a skilled Wagner engineer discuss your motor needs with you. Just call the nearest of our 32 branch offices, or write us.

Wagner Electric Corporation
EST. WEC 1891

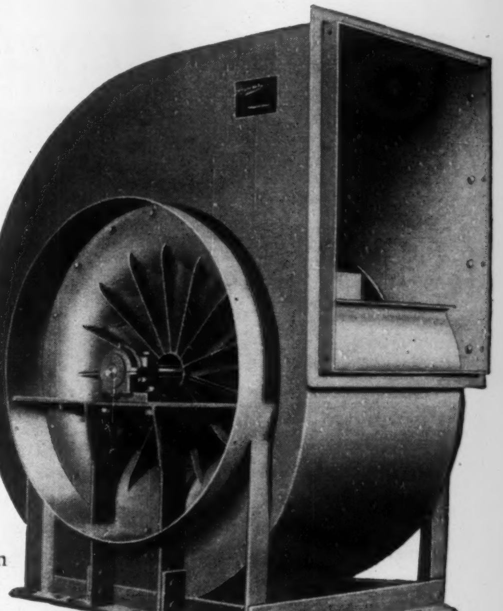
WAGNER ELECTRIC CORPORATION
6370 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

- ELECTRIC MOTORS
- TRANSFORMERS
- INDUSTRIAL BRAKES
- AUTOMOTIVE BRAKE SYSTEMS— AIR AND HYDRAULIC

M54-6

You'd Never Believe It Could Be So Quiet...



THAT'S WHY THEY CALL IT THE "HUSH-A-BYE BUFFALO" FAN

Briefly, the secret of the "Hush-A-Bye" quiet of the new "Buffalo" Type "BL" Limit-Load Ventilating Fan is *smooth* air handling. From inlet to outlet, air is moved through the fan almost "without a ripple". This new standard of air handling promises important benefits in any building where quiet is an efficiency factor. Why not see the engineering facts—the "Q" Factor*—behind this great new fan? Simply write for Bulletin F-100.

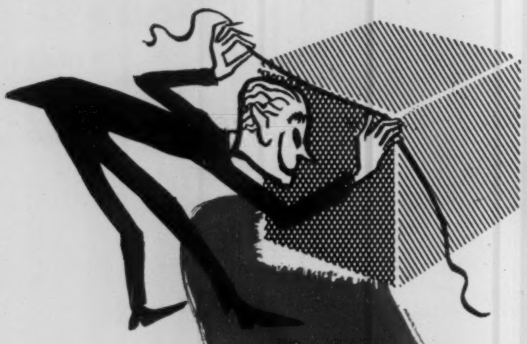
**The "Q" Factor — The built-in Quality which provides trouble-free satisfaction and long life.*

"Buffalo"

BUFFALO FORGE COMPANY
171 MORTIMER ST. BUFFALO, N.Y.
Publishers of "Fan Engineering" Handbook
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

"MADE TO ORDER"



THE SKIDMORE
Vertical TYPE "CV" PUMP
Size — 15″ x 15″ x 22″

THE IDEAL UNIT FOR

. . . air conditioning

Compact design — efficient trouble-free performance — The Skidmore "CV" Pump has long been a favorite in the heating pump field. NOW, this pump is winning new popularity! Engineers and contractors are specifying the Skidmore "CV" Pump for industrial and commercial air conditioning installations. Requiring a maximum space of 15″ x 15″ x 22″ the "CV" Skidmore Pump is easy to install and economical to operate.

Pump is bronze fitted throughout with enclosed centrifugal impeller. Shaft is stainless steel. Self lubricating bronze bearing directly above impeller insures proper alignment. Each pump is completely assembled and tested at factory. Call or write today for immediate shipment, or contact your Skidmore representative.

Skidmore Pumps have set a standard of performance and dependability through continual research and development since 1921.

SKIDMORE PUMPS

SKIDMORE CORPORATION • ST. JOSEPH, MICHIGAN

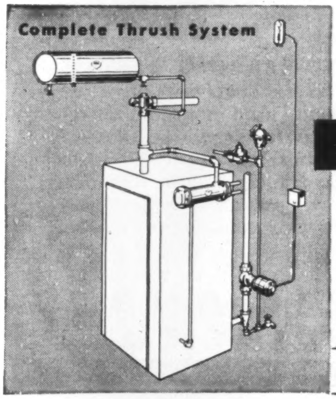
a real time saver
...no extra cost
*
ONLY GENUINE
THRUSH
PRESSURE
TANKS
HAVE THIS
FEATURE

LOOK FOR THE Vacuum Breaker *

WHEN YOU BUY PRESSURE TANKS

SAVE TIME! Save labor! Reduce service bills! Please your customers. How? Just insist on genuine Thrush Pressure Tanks for the hot water heating installations you make. Only Thrush Pressure Tanks have the built-in Vacuum Breaker which enables you to drain a waterlogged tank completely in just a few minutes. Best of all, this feature costs no more!

This is only one of the many advantages you can give your customers and yourself when you install Thrush equipment. Ask your wholesaler about it or use the coupon below.


Complete Thrush System

H. A. THRUSH & COMPANY

MAIL COUPON NOW FOR MORE INFORMATION

H. A. THRUSH & COMPANY
Department E-4, Peru, Indiana

Your built-in Vacuum Breaker feature of Thrush Pressure Tanks sounds valuable to us. Please send literature describing it.

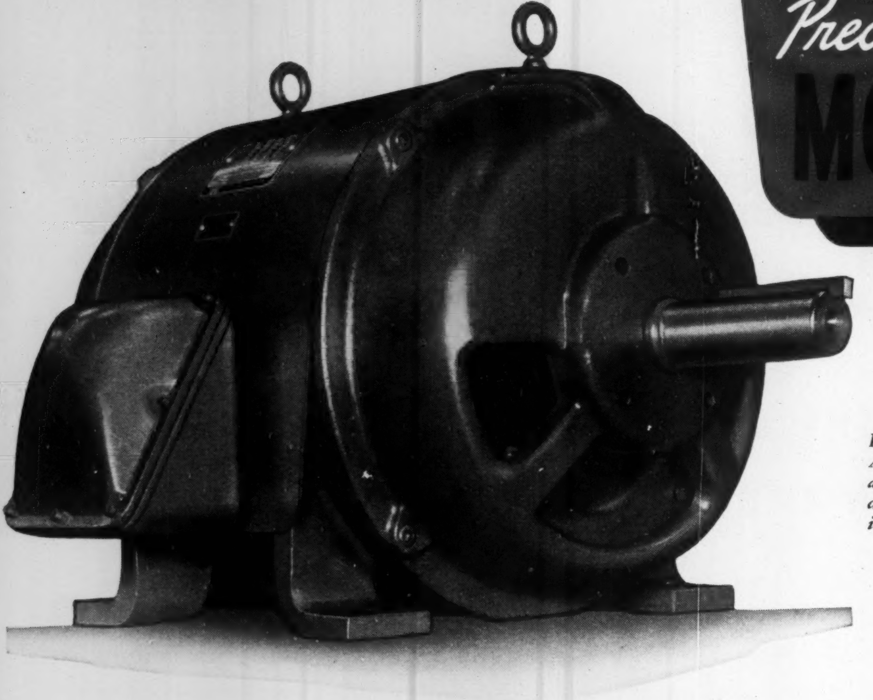
NAME ____________________

ADDRESS ____________________

FOR FAN SERVICE...

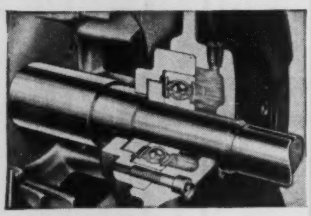
"All motors are NOT alike!"

RELIANCE
Precision-Built
MOTORS



Reliance Protected Open A-c. Motor. All other standard enclosures available, with wide choice of mechanical designs and special mountings. Ratings from ¾ to 300 hp.

- **Low starting currents... liberal ratings**
- **Smooth acceleration... quiet operation**
- **Tough, vibration-proof Reli-X insulation**



... AND THE BEST PRE-LUBRICATED BEARING DESIGN The Reliance pre-lubricated bearing provides *four times more operating hours without re-lubrication* than any other bearing used in motors today. And—whatever your lubrication schedule—*you just can't grease'em wrong!* To get the complete "inside story" on motor bearings, write today for Bulletin B-2201. It contains hard facts on the advantages of the Reliance pre-lubricated bearing design, with cutaway view, cross-section diagram, comparison chart, and statements by bearing manufacturers. B-1458D

RELIANCE ELECTRIC AND ENGINEERING CO.

1052 Ivanhoe Road, Cleveland 10, Ohio • *Sales Representatives in Principal Cities*

WALWORTH

iron body gate valves

with screwed or flanged ends

6
WALWORTH
6
125 WSP
200 OWG
WALWORTH
6
WALWORTH
6
125 WSP
200 WOG
WALWORTH

For complete information on these new Walworth Iron Body Valves, see your local Walworth distributor, or write for bulletin 106.

WALWORTH

valves and fittings

60 EAST 42nd STREET NEW YORK 17, N. Y.

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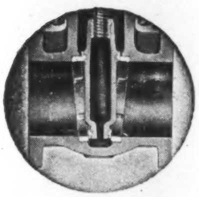
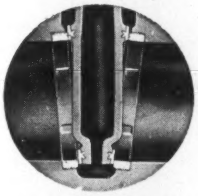
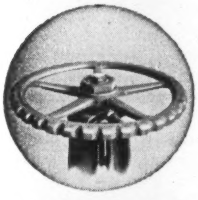
... 8 Outstanding Features



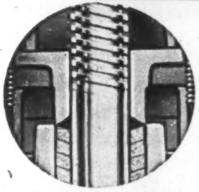
Straight-Flow Port Design reduces fluid turbulence to a practical minimum.



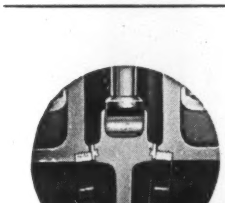
Seat Rings of end-seated type are screwed into the body.



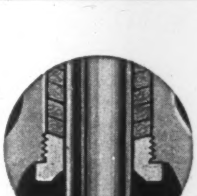
Sure-Grip Malleable Handwheel for non-skid gripping even with heavy gloves.



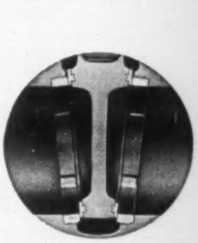
Brass Liner on Glands assures greater resistance to corrosion and scoring.



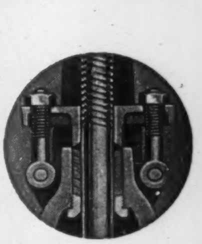
T-head Disc-to-Stem connection on OS&Y types provides stronger connection, prevents loosening of disc by corrosion.



Bronze Back-Seat Bushings in bonnets of OS&Y valves.



Solid Web Type Disc in OS&Y valves for greater strength and longer service.



Hinged Gland Eye-Bolts on OS&Y valves permit faster, easier repacking under full pressure.

PHYSICS . . In one easy lesson

or why *LEVERAGE* is a good invention

Reprinted from the No. 3, 1948, issue of the Armstrong Trap Magazine

A BURLY giant, whom we shall call Dullbottom for lack of a more descriptive name, was amusing himself in the Petrified Forest one warm July afternoon. Entranced by the many colorful and giant-sized playthings there, he was happily engaged in rolling petrified logs down a small incline when one toppled onto his toe. Despite his most persistent efforts he was unable to dislodge this log, later calculated by Unimpeachable Authorities to weigh 1,000 lbs.

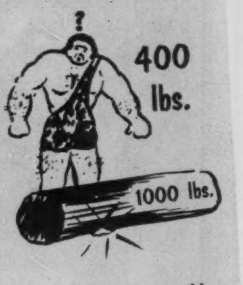
Dullbottom's gruntings and groanings attracted a petite and pretty Physics teacher who (fortunately for our story) was strolling in the vicinity. It took her but a glance to grasp the situation and, without hesitation, she obtained a crowbar from a convenient source of supply, applied LEVERAGE to the log and freed the giant's giant toe.

Completely befuddled by the powers of his 90 lb. benefactor, but clumsily grateful, he asked to feel her muscle, a request which was instantly refused. Instead, the young lady offered to explain the fundamentals of LEVERAGE. Delighted by her explanation, that given sufficient LEVERAGE, she could move any weight, Dullbottom immediately proceeded to roll a 4,000 lb. petrified log onto his other foot.

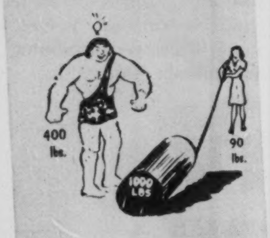
With the infinite patience acquired from dealing with adolescents in the classroom, our pretty Miss obligingly procured another crowbar four times as long as the first and proceeded to move the weight—BUT, much to the dismay of Dullbottom, only ¼ as far, which was, sad to relate, not far enough to free his toe.

And, thereby, hangs a tale. Let's use this little flight of fantasy to explain a fundamental reason why Armstrong steam traps have such large capacity for their size. Please refer to diagrams on the blackboard.

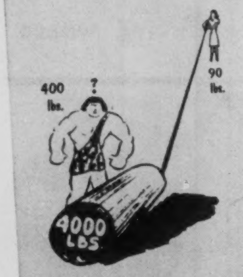
The Fairy Story


?
400 lbs.
1000 lbs.

1. All Brawn . . . No Brains


400 lbs.
90 lbs.
1000 LBS

2. Science to the Rescue


400 lbs.
?
90 lbs.
4000 LBS

3. Stupidity Triumphant

No Leverage

To open a 1-1/16" orifice at 15 psi, a steam trap without leverage would require a bucket weighing 19-1/2 lbs. and displacing 29-1/4 lbs. of water. A trap big enough to hold this bucket would weigh somewhere neai 300 lbs. At 250 psi, the largest orifice this trap could open would be 9/32".

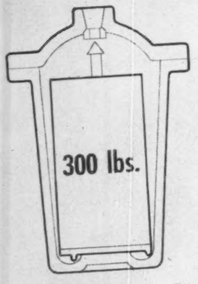
Correct Leverage

Contrast the No-Lever Trap with an Armstrong No. 216 weighing about 1/4 as much . . . 80 lbs. It also opens a 1-1/16" orifice at 15 psi and will open a 3/8" orifice wide at 250 psi—nearly 80% greater than that of the No-Lever Trap. Result of CORRECT LEVERAGE: less weight, less radiation, lower price trap, less installation cost, greater capacity.

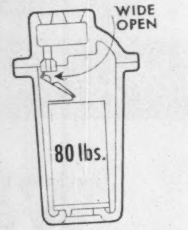
Too Much Leverage

Here's an 80 lb. trap with leverage double that of the No. 216 Armstrong described above. It will open an appreciably larger orifice at any given pressure than the standard Armstrong No. 216. *But, it won't open the valve wide!* There isn't room to get the valve completely away from its seat. Flow through the orifice is thereby restricted and capacity is reduced below that of the No. 216. The larger orifice and the greater leverage is a total loss! To get the valve wide open would require a bigger trap.

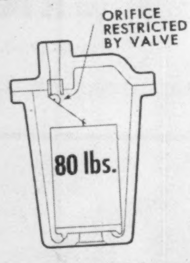
The Real Thing



Get Results . . . But Impractical



Efficiency, Economy



Misapplied Science

Size for Size, Armstrongs have greater capacity because the correct application of high leverage permits the full opening of a large orifice!

ARMSTRONG MACHINE WORKS
874 Maple Street
Three Rivers, Michigan

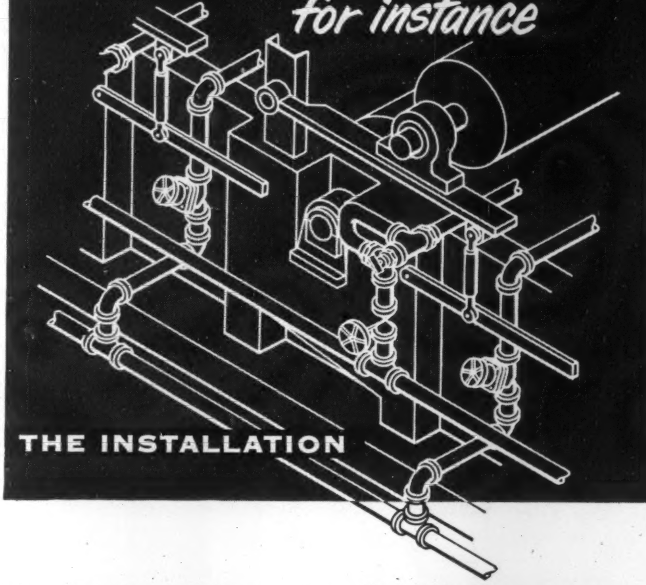
Send for Catalog

THE ARMSTRONG STEAM TRAP BOOK

ARMSTRONG STEAM TRAPS

Doing What Other Valves Couldn't

...on Slurry Service, for instance



THE INSTALLATION

Crane Diaphragm Valves on slurry-like white water service to cylinder tanks on paper-making machines at Excello Paper Products Co., Inc., Cincinnati.

VALVE SERVICE RATINGS

SUITABILITY: "Made to Order" for tough jobs

FEATURES: Seats tight where others fail

MAINTENANCE COST: None - needs no attention

SERVICE LIFE: Many times longer than expected

OPERATING RESULT: Plant efficiency improved

AVAILABILITY: Crane Catalog item - No. 1610

THE CASE HISTORY

Valves formerly used had been giving much trouble that started between tank fillings. While many replacements were tried, none of the valves could handle the white water solids and fibers that built up in the bonnet and seats between operations. Result was the valves were hard to operate, and leaked at the seats.

Keeping up with valve maintenance and the hazardous, messy floors caused by white water leakage was costly and annoying. But it was a problem that Crane Diaphragm Valves solved handily. The leakage stopped—machine room efficiency went up as the safety hazard was gone—plant appearance improved. Installed about a year ago, Crane Diaphragm Valves keep doing these things without a penny's maintenance cost to date.

THE VALVE

Crane Diaphragm Valves are packless. Bonnet and working parts are sealed to line fluid; there's no place for sediment to build up. Independent disc and diaphragm design saves wear on diaphragm, permits valve to be closed even should diaphragm fail. Pliable disc insert seats tight on foreign particles that cause leakage and wire drawing in ordinary valves. Choose these valves from wide variety of body and trim materials for corrosive, abrasive, and ordinary services. See your Crane Catalog or Crane Representative.

CRANE
150 W.O.G.

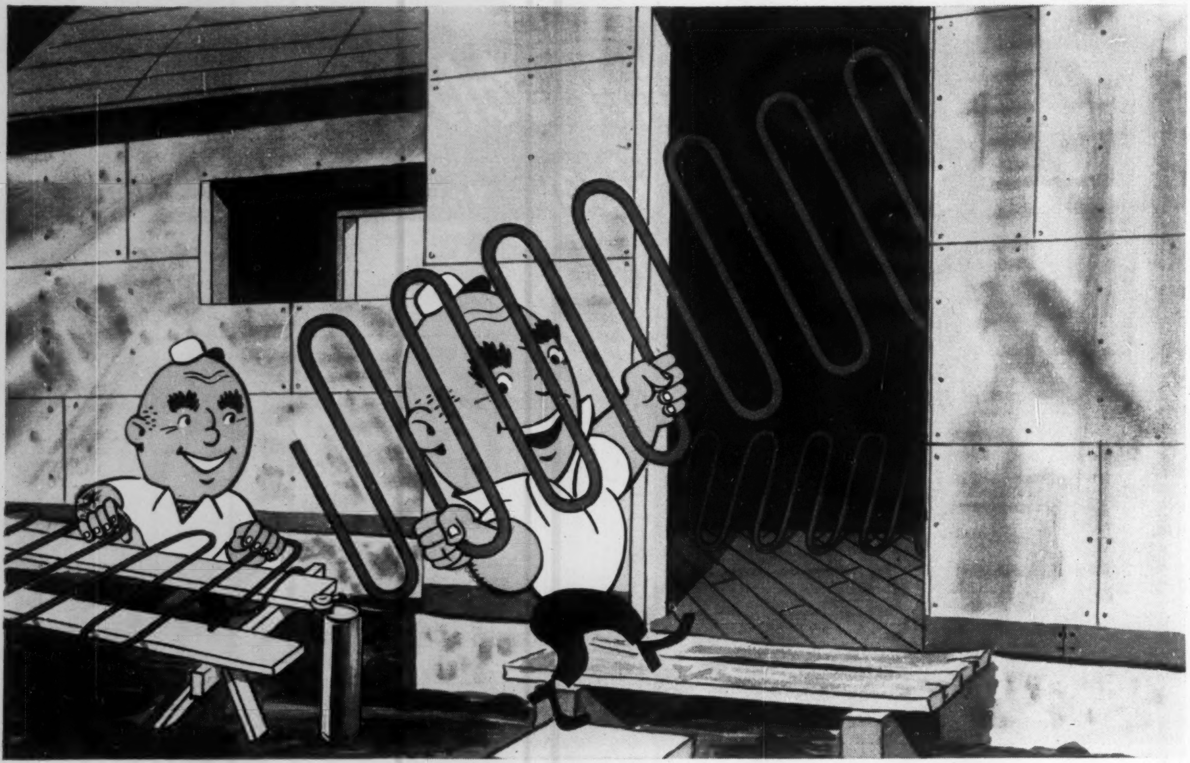
THE BETTER QUALITY... BIGGER VALUE LINE... IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

for the
THRIFTY
BUYER

VALVES • FITTINGS • PIPE • PLUMBING • HEATING



Offer ceiling radiant heating at lower cost

You save material costs and fabrication time with Bundyweld Tubing, performance-proved in thousands of ceiling radiant heating systems throughout the country.

Consider these advantages: Bundyweld is extra-strong, yet ductile; bends easily to short radii on a simple fixture in the shop or at the job site. It comes in standard, 20′ lengths with one end expanded, when specified, for simpler, sounder joining.

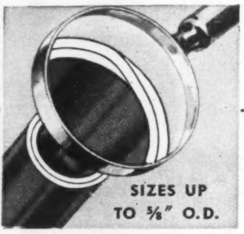
Bundyweld is tough enough to withstand the usual rough handling, too. Although lightweight, it's rigid enough so that two men can easily position a group of joined coils. The smooth coils keep their shape; lie flat against the ceiling for easy plastering, with no waste of time or material.

In your completed system, Bundyweld transmits heat efficiently; conducts water with a minimum of friction. Just check below for the advantages that only Bundyweld can give you. Then, write us today for more information.

Radiant Heating Division
Bundy Tubing Company • Detroit 14, Michigan

Bundyweld Tubing®

DOUBLE-WALLED FROM A SINGLE STRIP



NOTE the exclusive Bundy-developed beveled edges, which afford a smoother joint, absence of bead, and less chance for any leakage.

WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of steel which is copper-coated. Then, it's . . .

continuously rolled twice around laterally into a tube of uniform thickness, and

passed through a furnace. Bonding metal fuses with basic metal. Result . . .

SIZES UP TO ⅝ O.D.

Bundyweld . . . double-walled and brazed through 360° of wall contact.

Remember the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS.

tt
TUBE-TURN
TRADE MARKS

Engineered

for endurance

THE TUBE-TURN Welding Neck Flange is the preferred choice for most severe piping services—resulting from high pressures, temperature extremes, or numerous fluctuations of substantial amount in either temperature or pressure or both. Due to its long-tapered hub which affords a smooth transition in thickness, the welding neck flange assembly has an endurance strength equal to that of pipe joined by butt welds.

You can fill all your requirements for Welding Fittings and Flanges from TUBE TURNS' complete line. For prompt, efficient service, call your nearby TUBE TURNS' Distributor. You'll find one in every principal city.

The Leading Manufacturer of Welded Fittings and Flanges

TUBE TURNS

LOUISVILLE 1,
KENTUCKY

A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Chicago • Denver • Los Angeles
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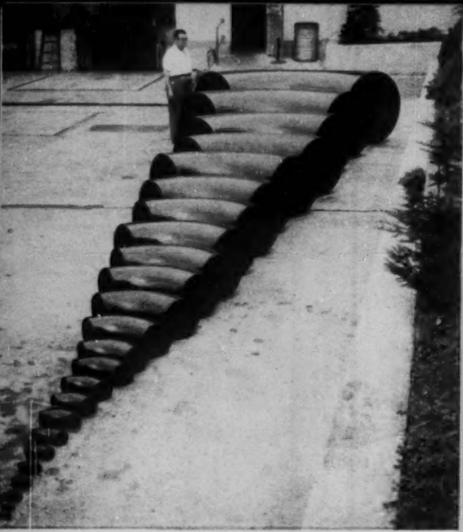
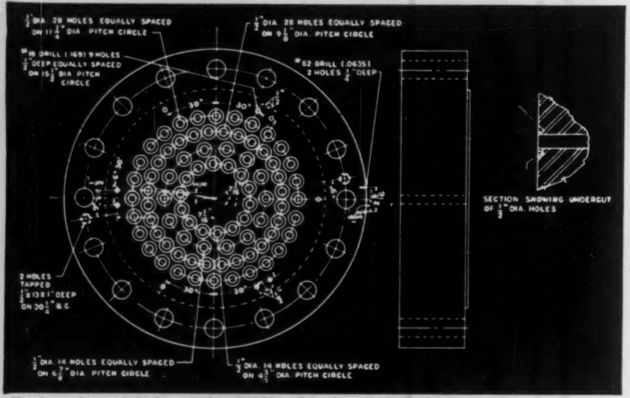
ENGINEERING SERVICE



YOUR NEEDS *in welding fittings and flanges are met efficiently and quickly by your nearby* TUBE TURNS' *Distributor. There are more than 4000 items in the complete line of* TUBE TURNS' *products. Example: carbon steel elbows from ½" to 42" diameter as shown.*

SIMPLIFIES JOB. *The uniform wall thickness and true circularity of* TUBE-TURN *Welding Elbows makes possible accurate fit-up when cut to odd angles for jobs such as the 16" gas line shown.*

Your problems solved by
TUBE TURNS' ENGINEERING SERVICE


½" DIA. 28 HOLES EQUALLY SPACED ON 11¼" DIA. PITCH CIRCLE
½" DIA. 28 HOLES EQUALLY SPACED ON 9⅛" DIA. PITCH CIRCLE
#18 DRILL (.169) 9 HOLES ½" DEEP EQUALLY SPACED ON 15½" DIA. PITCH CIRCLE
#52 DRILL (.0635) 2 HOLES ¼" DEEP
30°
30°
30°
30°
SECTION SHOWING UNDERCUT OF ½" DIA. HOLES
2 HOLES TAPPED ½"X13X1" DEEP ON 20¼" B.C.
½" DIA. 14 HOLES EQUALLY SPACED ON 6⅞" DIA. PITCH CIRCLE
½" DIA. 14 HOLES EQUALLY SPACED ON 4¾" DIA. PITCH CIRCLE

Design of special flange for holding heating elements.

MOST FLANGE NEEDS in industrial piping are filled by TUBE TURNS' ASA line of various types, sizes and materials. However, there are many exceptions . . . "specials" such as these: (1) lens ring flanges for use at 5300 psig and 400°F, with test pressure of 10,600 psig; (2) flanges in sizes from 14" through 72" for use at 30 psig and 400°F max.; (3) 2" flanges for high vacuum service at 400°F – 950°F, and (4) various complex sheet tube flanges.

A "special" example is shown at the left, developed by TUBE TURNS' Engineering Service Division for E. L. Wiegand Co., Pittsburgh. It has 84 holes for heating elements. Flanges must withstand hydrogen-nitrogen mixture at 1000 psig at 750°F and 3000 psig at atmospheric temperature.

TUBE TURNS IS AT YOUR SERVICE!

Want Dimension Data?

TUBE TURNS has compiled a handy folder of charts covering dimensions and weights of TUBE-TURN Welding Fittings and Flanges. If you'd like a free copy just send this coupon.

Dimensional
DATA
WEIGHTS

TUBE TURNS, Dept. A-2
224 East Broadway, Louisville 1, Kentucky

Company name ____________________

Company address ____________________

City ____________ *Zone* ____ *State* ____________

Your Name ____________________

Position ____________________

DISTRICT OFFICES

New York	Midland
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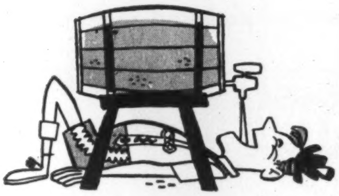
"tt" and "TUBE-TURN"
Reg. U. S. Pat. Off.

TUBE TURNS

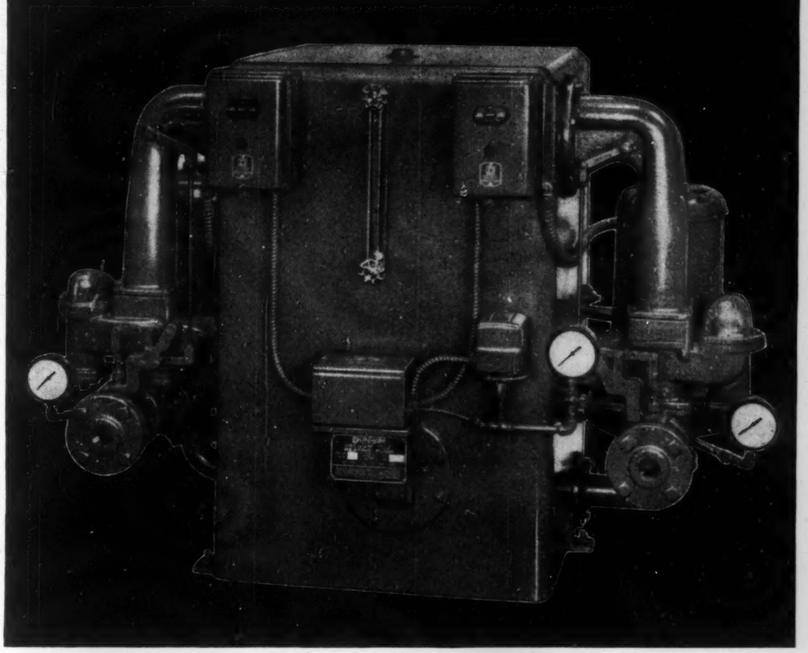
LOUISVILLE 1, KENTUCKY
A DIVISION OF NATIONAL CYLINDER GAS COMPANY

PUT 'EM IN FAST...AND FORGET 'EM!



"Low return lines"

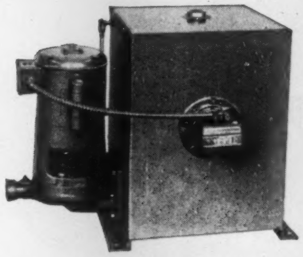
"Only one principal moving part"



You Can Put Dunham Vacuum Pumps in fast . . . and for less . . . because they're simple to install. For instance, return lines are at such low level, 9⅛″, there's no need for expensive "pitting." You just set three anchor bolts in the floor . . . and your Dunham pump is in to stay.

You Can Forget Dunham pumps once they're in, too. For they pull and maintain . . . at low amperage . . . up to 26″ vacuum without dependence on close clearances—and do it for years without repairs. For you see, there's only ONE principal moving part.

A single motor, mounted high and dry, easily handles BOTH air and condensate removal. Full range of sizes and types, both single and duplex models. Clip coupon for complete information.



Dunham Condensate Pumps **assure fast, positive removal of condensate. Completely wired, ready for immediate use. Side-mounted motors. Anchor bolts—not bars and bed plates—secure pump to floor. Single and Duplex models.**

DUNHAM VACUUM PUMPS

Quality First for Fifty-One Years

RADIATION • UNIT HEATERS • PUMPS • SPECIALTIES

C. A. DUNHAM COMPANY • CHICAGO • TORONTO • LONDON

C. A. DUNHAM COMPANY
Dept. HPAC-4, 400 W. Madison St.,
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Please send Pump Bulletin.

Name____________________

Company____________________

Address____________________

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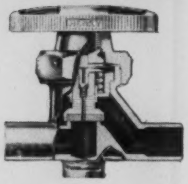
HENRY LINE VALVES really give you something extra

They give more dependable service because of advanced field-proven design and construction as well as patented features.

PACKLESS VALVES

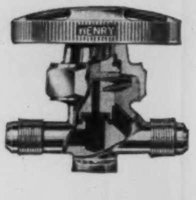
FOR FREON

with Exclusive Balanced-Action



STANDARD TYPE

Ball check in balancing channel permits diaphragm inspection and replacement with valves under line pressure. Sizes, ¼" thru ⅝" flare; ¼" thru 1⅝" O.D. Solder, ¼" thru ½" F.P.T.



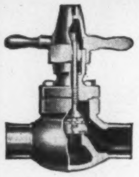
BLUE BANTAM TYPE

Same as standard Balanced-Action valve except that diaphragms cannot be inspected or replaced under line pressure. Size ¼" thru ⅝" flare and O.D. Solder.

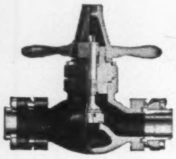
PACKED VALVES

FOR FREON

Bronze-Wing Cap Type



Globe and angle types with solder connections, bolted bonnets, sizes ⅞" thru 5⅛" O.D.



SEMI-STEEL WING CAP TYPE

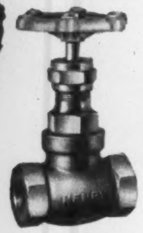
With bolted bonnets and square companion flanges. Furnished with brass tailpieces (O.D. Solder) 1⅜" thru 5⅛" or with steel tailpieces for welding to pipe, sizes 1¼" thru 5".

Also Globe and angle types with F.P.T. connections, sizes ½" thru 2".

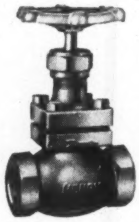
PACKED VALVES

FOR AMMONIA

Permanent-Mold Iron and Semi-Steel



Compact and strong with self-aligning stem disc. Sizes (F.P.T.), screw bonnet: ¼" thru 1", bolted bonnet 1¼" thru 2"—with flange connections 1¼" thru 5".



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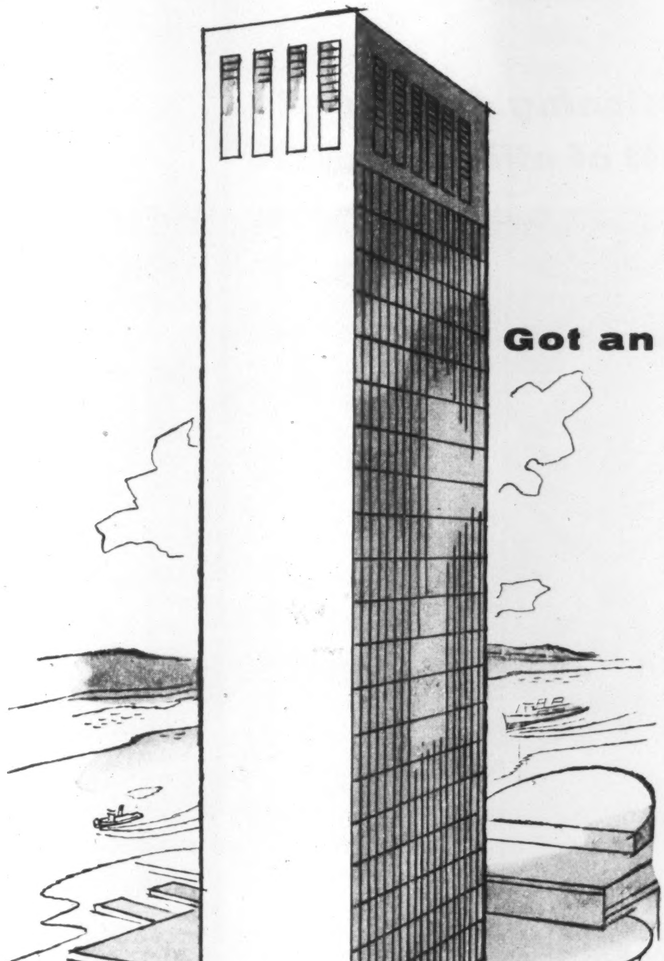
WRITE FOR CATALOGS

HENRY VALVE CO.

HENRY VALVE CO
CONTROLLING FLOW
SINCE 1914

Valves—Driers—Strainers—Control Devices and Accessories for Refrigeration, Air Conditioning and Industrial Applications

MELROSE PARK, ILL. (CHICAGO SUBURB)
CABLE: HEVALCO, MELROSE PARK, ILLINOIS
®



Got an exhaust air problem?

In an air conditioned New York skyscraper the exhaust of washroom air presented a problem. Fortunately, the engineers could solve it effectively and economically by installing Dorex Air Recovery in the ventilating system.

Here, Dorex Air Recovery purifies 33,600 cubic feet of washroom air per minute so thoroughly that the air can be, and is, re-used in other parts of the building. This not only reduces the air conditioning load, but eliminates the need for two large ducts running up through 39 floors—an important saving in space as well as cost.

You can make Dorex Air Recovery a part of air conditioning and ventilating systems either new or old. The latter is particularly important because changed conditions within the building often create problems in ventilation that could not otherwise be solved except at great expense.

Dorex Air Recovery is backed by more than 20 years of experience and over 10,000 installations. Find out how it can benefit you. Mail the coupon today for full information. Connor Engineering Corporation, Danbury, Connecticut.

CONNOR
ENGINEERING
CORPORATION
dorex®
air recovery

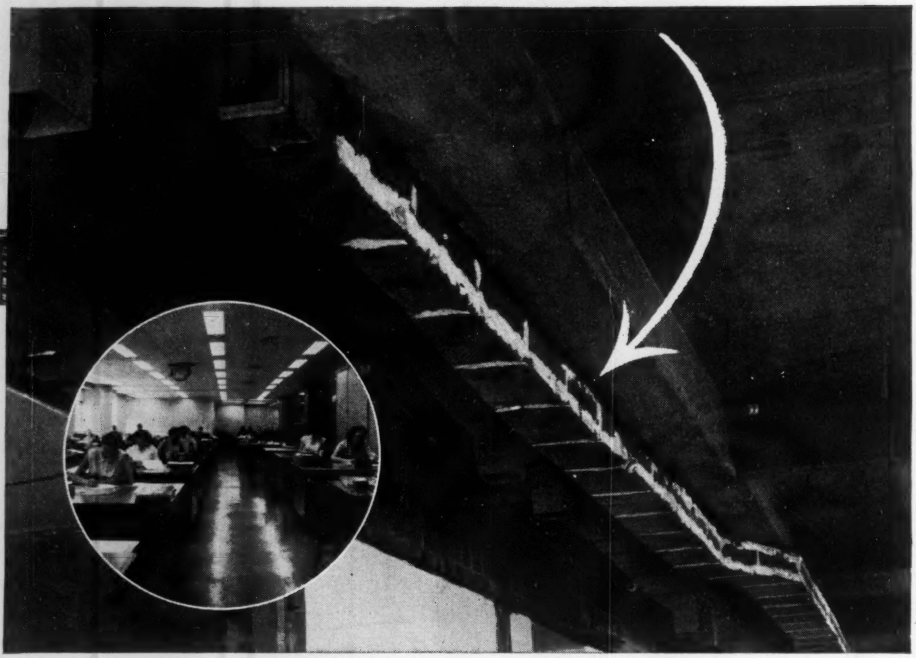
CONNOR ENGINEERING CORP.
Dept. A-44, Danbury, Connecticut
Please send me, without obligation, complete information on Dorex Air Recovery.

Name____________________
Position____________________
Company____________________
Street____________________
City__________ **Zone**_____ **State**_____

Above: New York City's new Chrysler Building East (foreground) and the original Chrysler Building erected some 20 years ago.

Right: Spintex insulation on the air-conditioning ducts serving offices in the Chrysler Building East. Applied by the Asbestos Construction Company, Inc. of New York, an outstanding J-M Insulation Contractor.

On air-conditioning ducts serving 420,000 sq ft of office space...



CHRYSLER BUILDING EAST SPECIFIES J-M *Spintex* DUCT INSULATION FOR YEAR 'ROUND OFFICE COMFORT

Running through the 32 stories of the new companion structure to the original Chrysler Building are miles of air-conditioning ducts . . . all insulated with Johns-Manville Spintex.

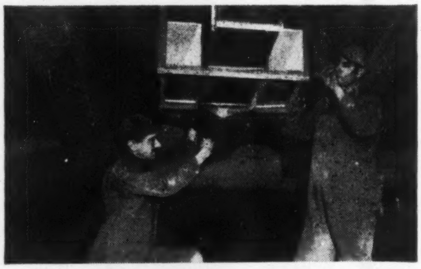
Spintex was chosen because it helps assure the greatest office comfort at the lowest operating cost. It has low thermal conductivity . . . plus resistance to moisture, fire, rot and mold growth. It is one of the most effective insulations for guarding against heat transfer and moisture accumulation.

Johns-Manville flexible, semi-rigid and rigid insulations for air-conditioning ducts meet every industrial requirement. Basically mineral products, each type has its particular characteristics that make it specially suitable for a specific air-conditioning service. All have the low heat transfer properties that are needed for high insulating efficiency.

Proper engineering and application are essential to the peak performance of any insulation. J-M Insulation Engineers and J-M Insulation Contractors stand ready to give you a top quality insulation job that will more than pay off your initial investment with maximum fuel savings.

For further information, write for a copy of Brochure IN-135A. Address Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto 1, Ont.

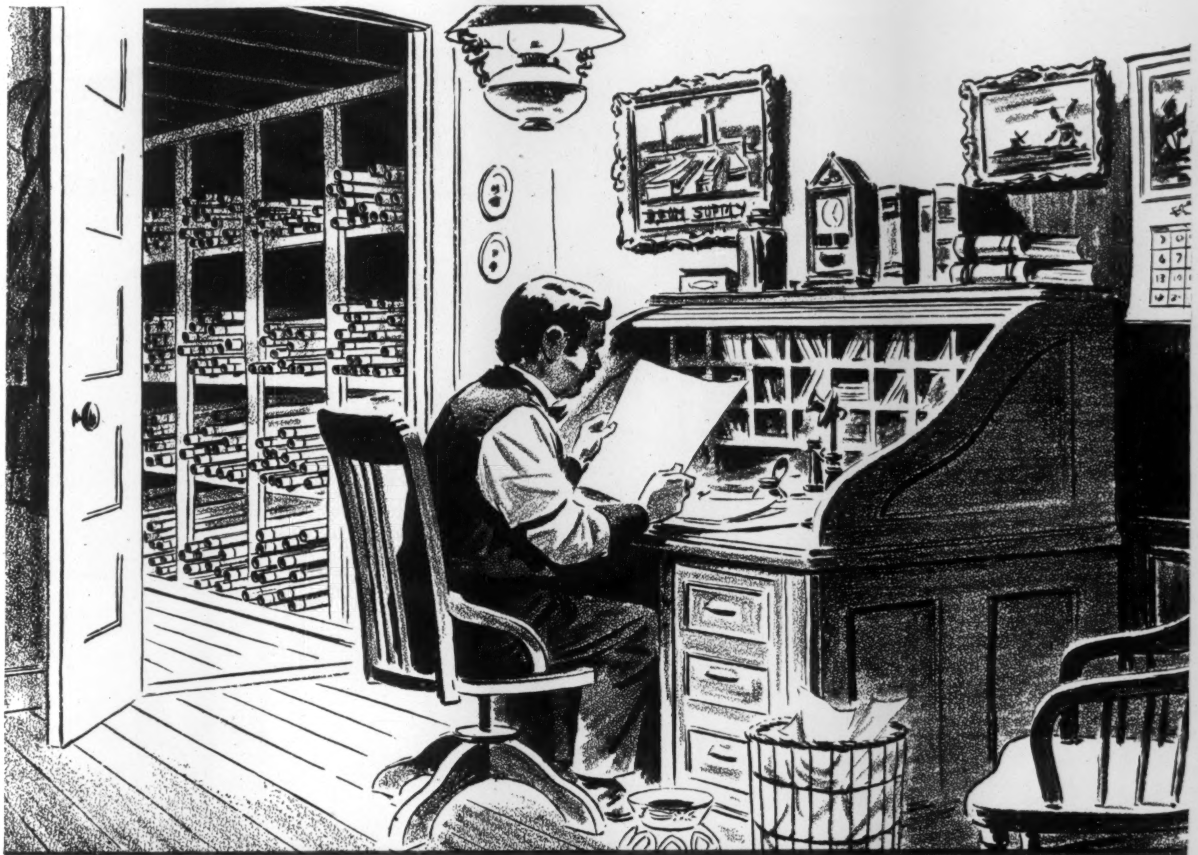
JOHNS-MANVILLE JM PRODUCTS



J-M insulation applicators applying Spintex on an air-conditioning duct. Thoroughly familiar with J-M insulating materials and application methods, these men have the skill that assures maximum dividends in greater fuel and power savings over the years.

Johns-Manville *FIRST IN* INSULATION

MATERIALS • ENGINEERING • APPLICATION



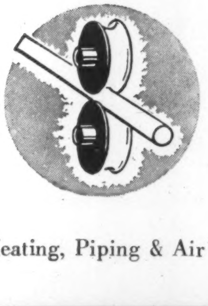
LARGE STEEL PIPE INVENTORIES are Old-Fashioned

You probably have on hand the supplies you need for the everyday run of small jobs. But when it comes to the steel pipe, fittings, valves, fixtures, controls and tools needed for the big ones, it's old-fashioned to stock these parts. Expensive, too.

The thrifty way is to let your Republic Steel Pipe Distributor stock them for you. He has on hand everything you need for complete plumbing, heating, refrigeration, air-conditioning, process and industrial piping, or other piping jobs.

He'll deliver them in a hurry, whether it's just a few lengths or a truckload. You get the supplies you need, when you need them. And you save floor space, insurance and handling costs.

It's profitable to do business with your Republic Steel Pipe Distributor. A phone call is all it takes to get started.

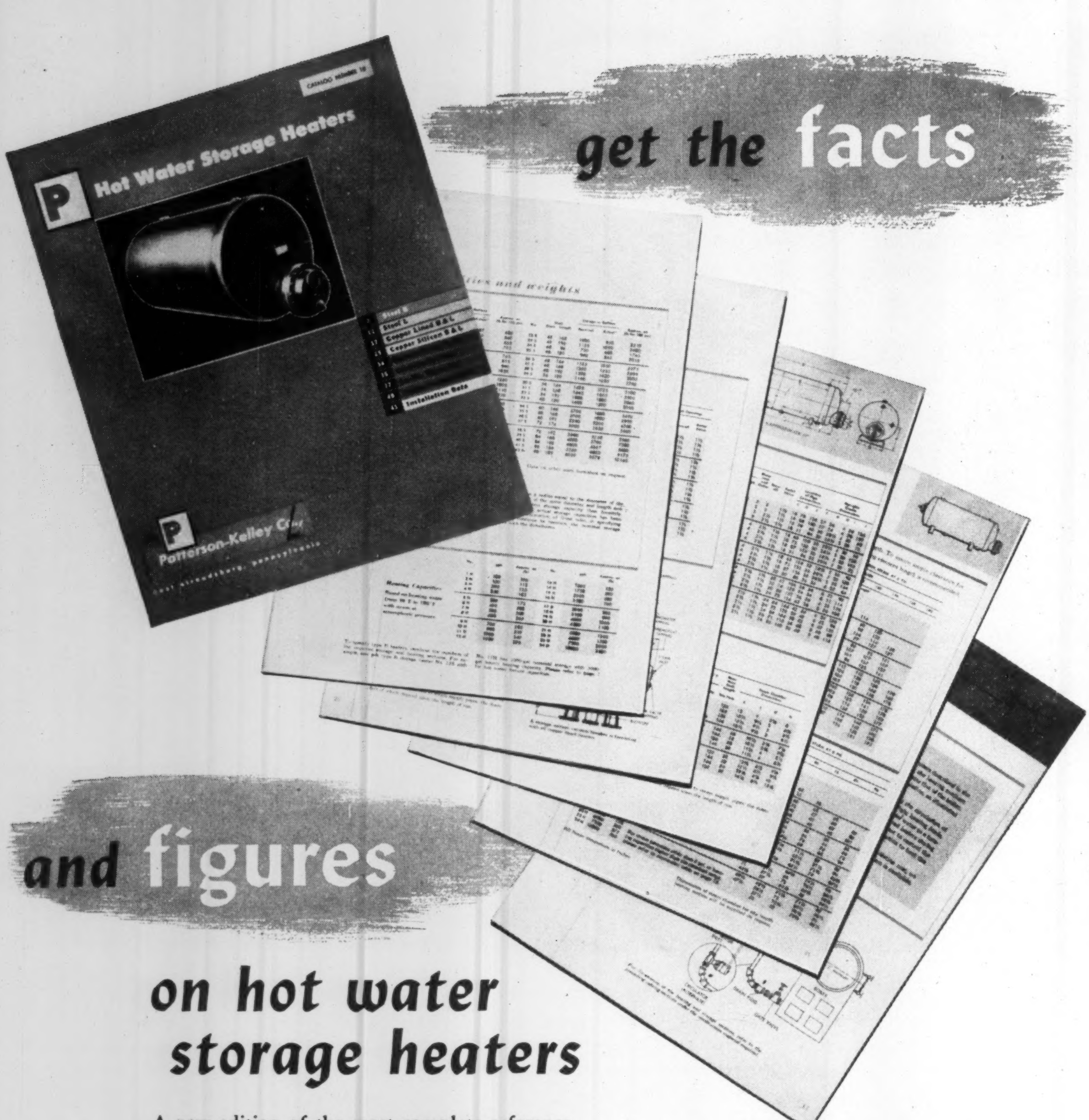


Easy to bend, thread, and close coil
Easy to weld by all methods
Uniformly ductile
Uniformly strong
Uniformly clean and scale-free
Uniform wall thickness, diameter, concentricity
Economical uniform lengths, extra long lengths

REPUBLIC STEEL PIPE

REPUBLIC STEEL ®

get the facts



and figures

on hot water storage heaters

A new edition of the most complete reference catalog of its kind, covering all types, sizes and styles of **p-k** hot water storage heater equipment. A reference work needed by every architect, engineer, contractor or user of hot water for process or service. Because of its size, cost, and importance, will you please request your Free copy on your company letterhead.

the Patterson-Kelley Co., inc.

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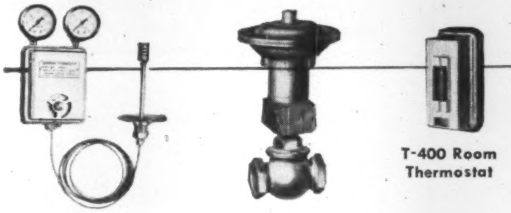
1992

101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16 • and other principal cities.

here's the *AUTOMATIC ANSWER* to TEMPERATURE REGULATION PROBLEMS

IN STORES

Robinson's Beverly Hills, Beverly Hills, Calif. Pereira & Luckman and Chas. O. Matcham, architects; Samuel L. Kaye, mechanical engineer; Kilpatrick and Co., air conditioning contractors, all of Los Angeles.



T-800 Capillary Thermostat

V-97 Coil Valve

T-400 Room Thermostat

Robinson's Beverly Hills, a branch of the J. W. Robinson Co. in downtown Los Angeles, is Beverly Hills' first complete department store. Recognizing customer comfort as a key requirement in attracting maximum store traffic, this modern merchandising organization has provided Johnson Controlled year-'round air conditioning to assure the ultimate in shopping comfort.

With Johnson Control in command, the 12 central-fan air conditioning systems are under complete and precise control at all times. As patrons move from floor to floor or from section to section, uniform temperatures assure the best possible shopping atmosphere. Adequate, practical zoning, carefully planned, makes it perfectly possible to cool certain sections while other areas, even on the same floor, are being heated.

The accuracy and flexibility enjoyed at Robinson's Beverly Hills are typical of Johnson Control Systems, because each one is specifically designed and installed by Johnson to meet the needs of the individual control problem. That is why you will find Johnson "*Planned-for-the-Purpose*", "*Installed-for-the-Purpose*" control not only in leading department stores, but in every type of public, commercial, and industrial building.

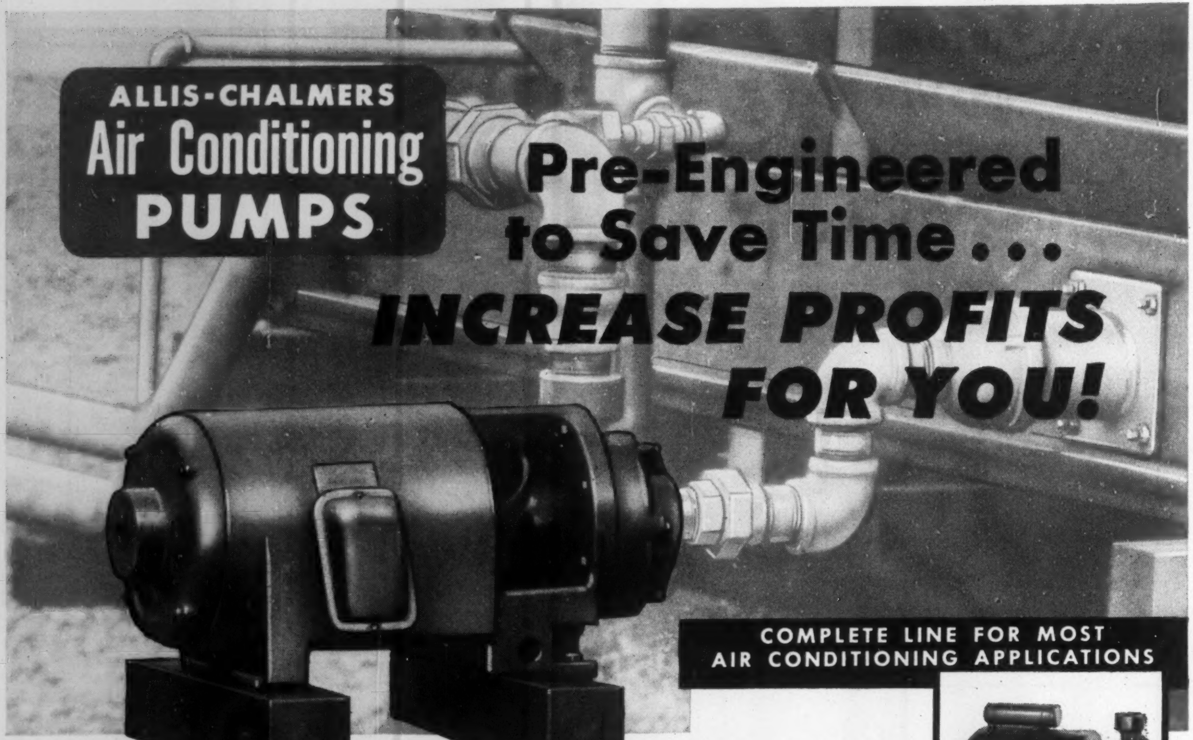
The experience of the nationwide Johnson organization is at your disposal without obligation. Why not let a Johnson engineer, from a nearby branch office, solve your temperature control problems? JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.

JOHNSON *Automatic Temperature and Air Conditioning* **CONTROL**

MANUFACTURE • APPLICATION • INSTALLATION • SINCE 1885

ALLIS-CHALMERS
Air Conditioning PUMPS

Pre-Engineered to Save Time . . . *INCREASE PROFITS FOR YOU!*



Pre-engineering of your air conditioning installation by Allis-Chalmers means a more profitable installation for you. You are relieved of much expensive and time-consuming application engineering work . . . and you are sure that you are getting the right pump for your needs.

Allis-Chalmers engineers have wide experience in applying air conditioning pumps. Because they have a complete range of types and sizes to choose from, they can help you select the exact pump you need for dependable performance at lowest possible cost. Allis-Chalmers engineers can often suggest changes in your installation that will make it simpler and more satisfactory. And, when you use Allis-Chalmers equipment, you have *one reliable guarantee* for the complete pump and motor unit.

SAVE ON INSTALLATION TIME, TOO

Bolt it down, hook up the power, ground and piping, and your Allis-Chalmers pump is ready to go. There's no alignment problem. Correct installation is a big factor in pump performance and your Allis-Chalmers representative will help you here, too.

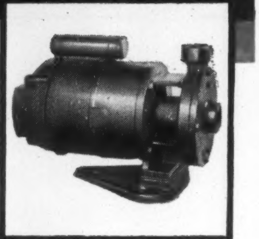
For Application Help, call your nearby Allis-Chalmers District Office. For more information about Allis-Chalmers air conditioning pumps, write for bulletins 52B7529, 52B6140, 52B6083 or 52B6975. Allis-Chalmers, Milwaukee 1, Wisconsin.

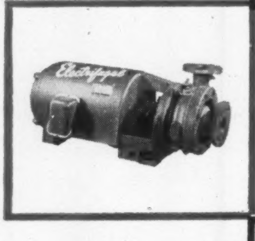
A-4327

Electrifugal is an Allis-Chalmers trademark.

COMPLETE LINE FOR MOST AIR CONDITIONING APPLICATIONS

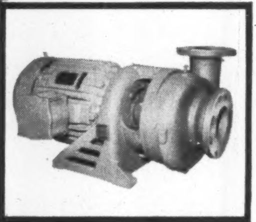
FHP PACKAGE PUMP
Standard with mechanical seal. Widely used and accepted for air conditioning and refrigeration.
BULLETIN 52B7529





***ELECTRIFUGAL* PUMP**
A close-coupled pump with either conventional packing or mechanical seal.
BULLETIN 52B6140

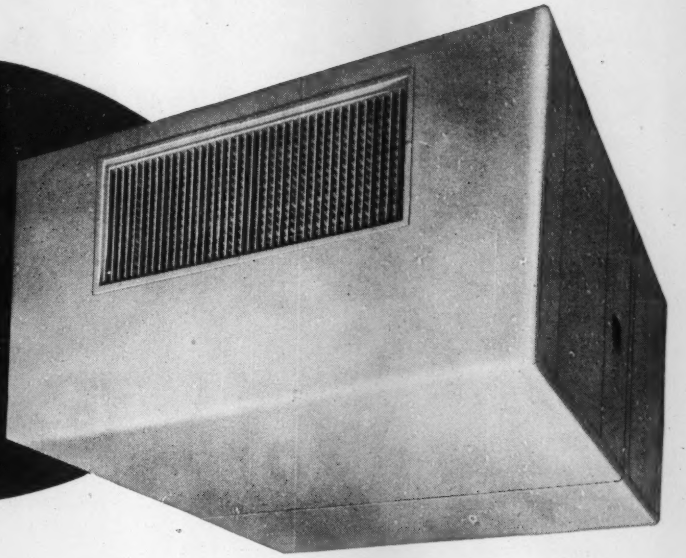
SUPPORTING ADAPTER PUMP
Flange motor and pump on sturdy supporting adapter. With conventional packing or mechanical seal. BULLETIN 52B6083



VERTICAL MOUNTED PUMP
Mechanical seal or sealless units with choice of submerged or sidewall mounting. BULLETIN 52B6975

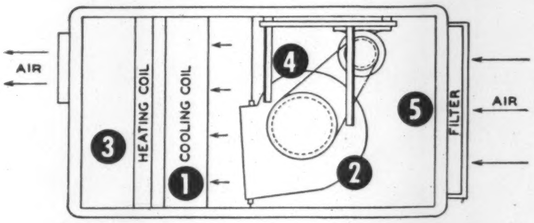
ALLIS-CHALMERS

NEW FEATURES of PROVEN MERIT



KRAMER

AIR CONDITIONING UNITS



(1) MUGGY-AIR-CONTROL

It "squeezes" extra moisture from the air on muggy days without reheating, dampers or excessive cooling. No short cycling and uncomfortable conditions.

(2) "BLOW-THROUGH" DESIGN

Fan-motor assembly always exposed to normal room temperatures. A unique design with many advantages, resulting in —

No motor overload and no loss of bearing lubricant from hot air of the heating coils.

No corrosion of fan-scroll assembly from moisture carry-over of the cooling coils.

(3) ANTI-SWEAT CONSTRUCTION

Only a small portion of the casing is exposed to cooled air; that section is heavily insulated.

Access doors and grille have scientific anti-sweat designs.

(4) QUIET OPERATION

The fans and motor form an integrated assembly independently rubber-mounted to the casing. All moving parts are completely isolated by rubber.

(5) FOR FINISHED INTERIORS

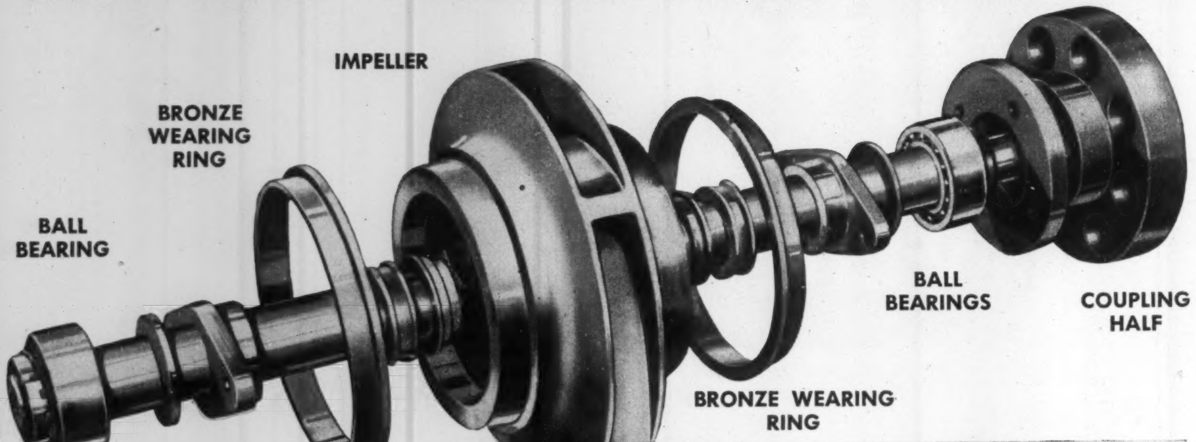
Graceful lines with no unsightly belts, motor and guards exposed to view. Finished in hammer gray enamel.

MANY OTHER OUTSTANDING FEATURES.

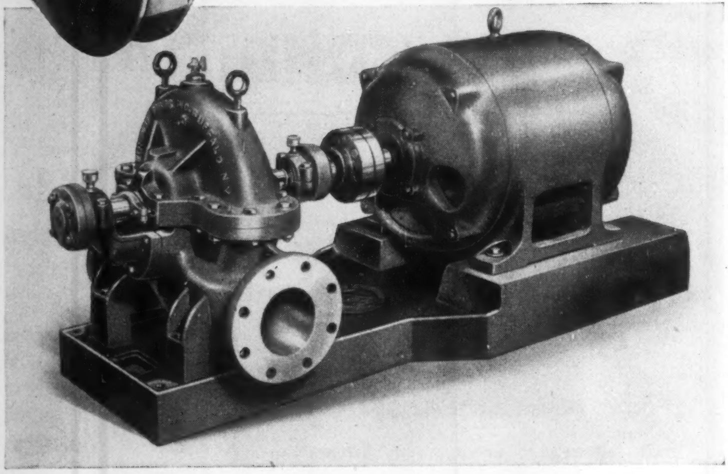
WRITE FOR BULLETIN AC-238

KRAMER TRENTON CO. • Trenton 5, N.J.

INSIDE STORY OF A BETTER PUMPING VALUE



IMPELLER-AND-SHAFT ASSEMBLY OF A "BUFFALO" DOUBLE SUCTION PUMP



"Buffalo" Double Suction Pump

Take a look at the "heart" of a clear water pump that is built for performance and endurance! Note the oversize shaft and ample ball bearings to stand the severest continuous-service strains. The double suction enclosed impeller is hydraulically balanced and has vanes and shrouds shaped for maximum efficiency. The two large bronze wearing rings on either side of the impeller prevent leakage, thus keeping efficiency high.

And in the pump casing, water passages are simply formed with ample area to avoid friction losses and sudden changes of velocity. (Top half of casing is easily removable without disturbing piping, for quick servicing of impeller and stuffing boxes).

Here is a pump that cuts your costs where economy really counts — in continued high efficiency, in freedom from breakdowns, in easy maintenance and the kind of lifetime performance you need on your pumping job. Write for Bulletin 955-P and check construction data on these pumps in sizes from 10 to 14,000 gpm.

"Buffalo" PUMPS

BUFFALO PUMPS, INC.
171 MORTIMER ST. BUFFALO, N.Y.
Subsidiary of Buffalo Forge Company

Canada Pumps, Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

STARTLING NEW FACTS ON EXPANSION JOINT MAINTENANCE

It may cost less than you think to service expansion joints. Look at these records from three typical users of Yarway Gun-Pakt Expansion Joints:

To add packing to a Yarway Gun-Pakt joint, just insert a slug and twist a wrench; the joint is tight, the job done. *There is no unpacking operation.*

	YARWAY GUN-PAKT JOINTS	CONVENTIONAL GLAND-PACKED JOINTS
STATE UNIVERSITY*	Required addition of only 3 slugs (45 cents) of packing in 5 years. Lubrication only once every 6 months. Total labor time of only 2 manhours in 5 years.	Same lubrication as Gun-Pakt, *plus* gland tightening, *plus* complete overhaul with shutdown for unpacking and repacking every 3 to 4 years. Time for overhaul—25 manhours per joint!
MID-WEST AIRFIELD*	Only maintenance was lubrication and addition of 2 slugs (30 cents) of packing per year. Total labor ¼ manhour per joint per year.	Lubrication and gland tightening required 8 manhours per joint per year—plus complete unpacking and overhaul every 2 to 3 years. Time required for overhaul—20 manhours per joint.
"BIG TEN" UNIVERSITY*	Lubrication only once every 2 months, with packing added as needed. Total labor time charged, 1 manhour per joint per year.	General maintenance requires 6 manhours per joint per year. Complete overhaul required every 2 to 3 years with unpacking and repacking—24 manhours per joint.

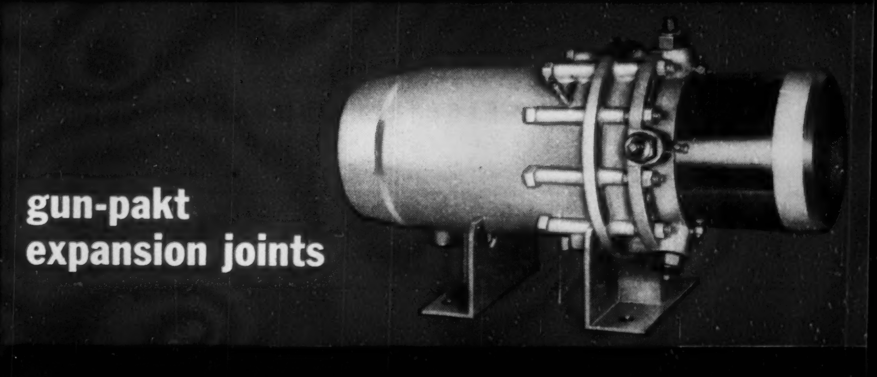
**Names on request.*

To get the full facts on Yarway Gun-Pakt Expansion Joints, and how they can save you maintenance money, write for Yarway Bulletin EJ-1913.

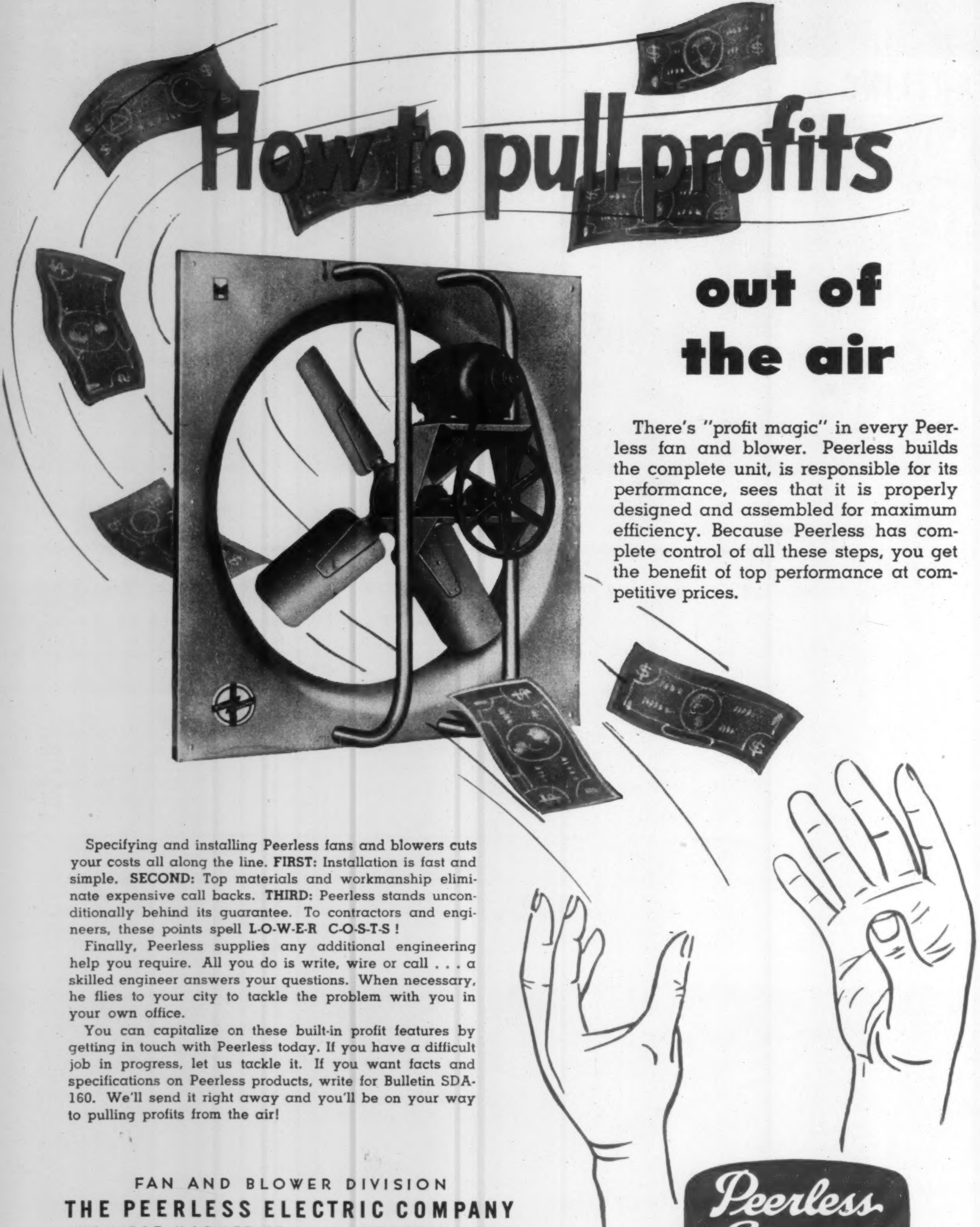
YARNALL-WARING COMPANY
107 Mermaid Ave., Philadelphia 18, Pa.

YARWAY

Yarway single-end, welding type Gun-Pakt joint for pressures to 300 psi, heavier design for higher pressures. Single-end traverses up to 12 inches; double-end up to 24 inches.



How to pull profits out of the air



There's "profit magic" in every Peerless fan and blower. Peerless builds the complete unit, is responsible for its performance, sees that it is properly designed and assembled for maximum efficiency. Because Peerless has complete control of all these steps, you get the benefit of top performance at competitive prices.

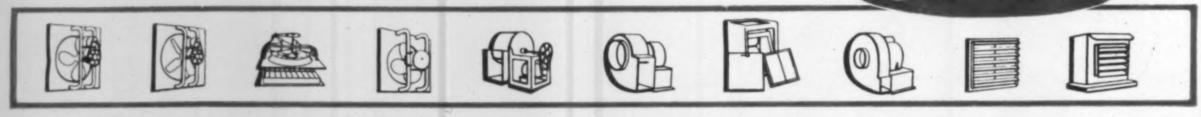
Specifying and installing Peerless fans and blowers cuts your costs all along the line. **FIRST:** Installation is fast and simple. **SECOND:** Top materials and workmanship eliminate expensive call backs. **THIRD:** Peerless stands unconditionally behind its guarantee. To contractors and engineers, these points spell **L-O-W-E-R C-O-S-T-S!**

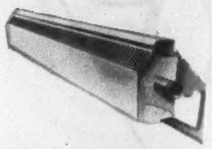
Finally, Peerless supplies any additional engineering help you require. All you do is write, wire or call . . . a skilled engineer answers your questions. When necessary, he flies to your city to tackle the problem with you in your own office.

You can capitalize on these built-in profit features by getting in touch with Peerless today. If you have a difficult job in progress, let us tackle it. If you want facts and specifications on Peerless products, write for Bulletin SDA-160. We'll send it right away and you'll be on your way to pulling profits from the air!

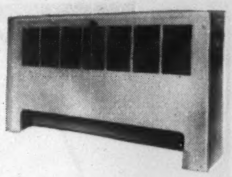
FAN AND BLOWER DIVISION
THE PEERLESS ELECTRIC COMPANY
1409 WEST MARKET ST. · WARREN, OHIO

Peerless Electric

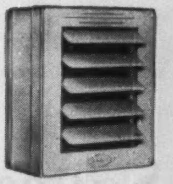




Florvector* Baseboard Heating



Convector-Radiator



Horizontal Unit Heater

Down Blow Unit Heater

*Trademark

UNARCO® year 'round weather conditioning

World's finest heating and cooling products in a complete range of types and sizes

UNARCO Quality engineered

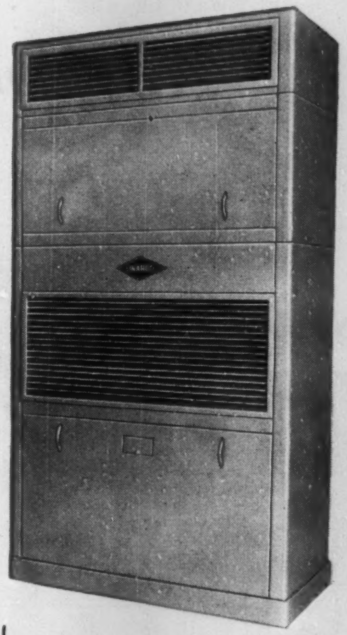
Dependable performance UNARCO

UNARCO Priced to sell UNARCO

Eight manufacturing plants UNARCO

31 sales offices

UNARCO Get the facts before you buy



self-contained highboy

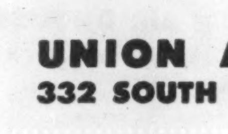
2, 3, 5, 7½, 10 and 15 ton cooling capacities.

Heating capacities up to 450,000 BTU per hour.

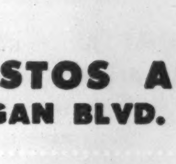
All UNARCO Products are available in Canada.

UNION ASBESTOS AND RUBBER COMPANY

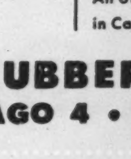
332 SOUTH MICHIGAN BLVD. • CHICAGO 4 • WEBSTER 9-5444



Wall Radiation



Furnace Air Conditioner

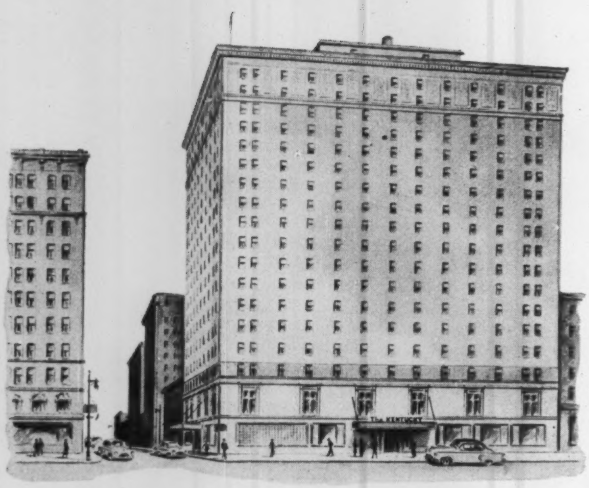


Mobile Air Conditioner

AEC Air Conditioner

Hotel Saves 17%

with Anemostat High Velocity Air Conditioning System



The Kentucky Hotel, Louisville, Ky., lost no room rentals during installation of its High Velocity air conditioning system.

There were three bids for the High Velocity air conditioning system for the Kentucky Hotel in Louisville. The Anemostat High Velocity System was selected at an overall saving of 17% over bidder number two, and 20% over bidder number three.

Anemostat's High Velocity System has the widest range of application for both alteration jobs and new construction. Write for HV Manual 48.

ANEMOSTAT®

DRAFTLESS *Aspirating* **AIR DIFFUSERS**

ANEMOSTAT CORPORATION OF AMERICA

10 EAST 39th STREET, NEW YORK 16, N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES

"No Air Conditioning System Is Better Than Its Air Distribution"

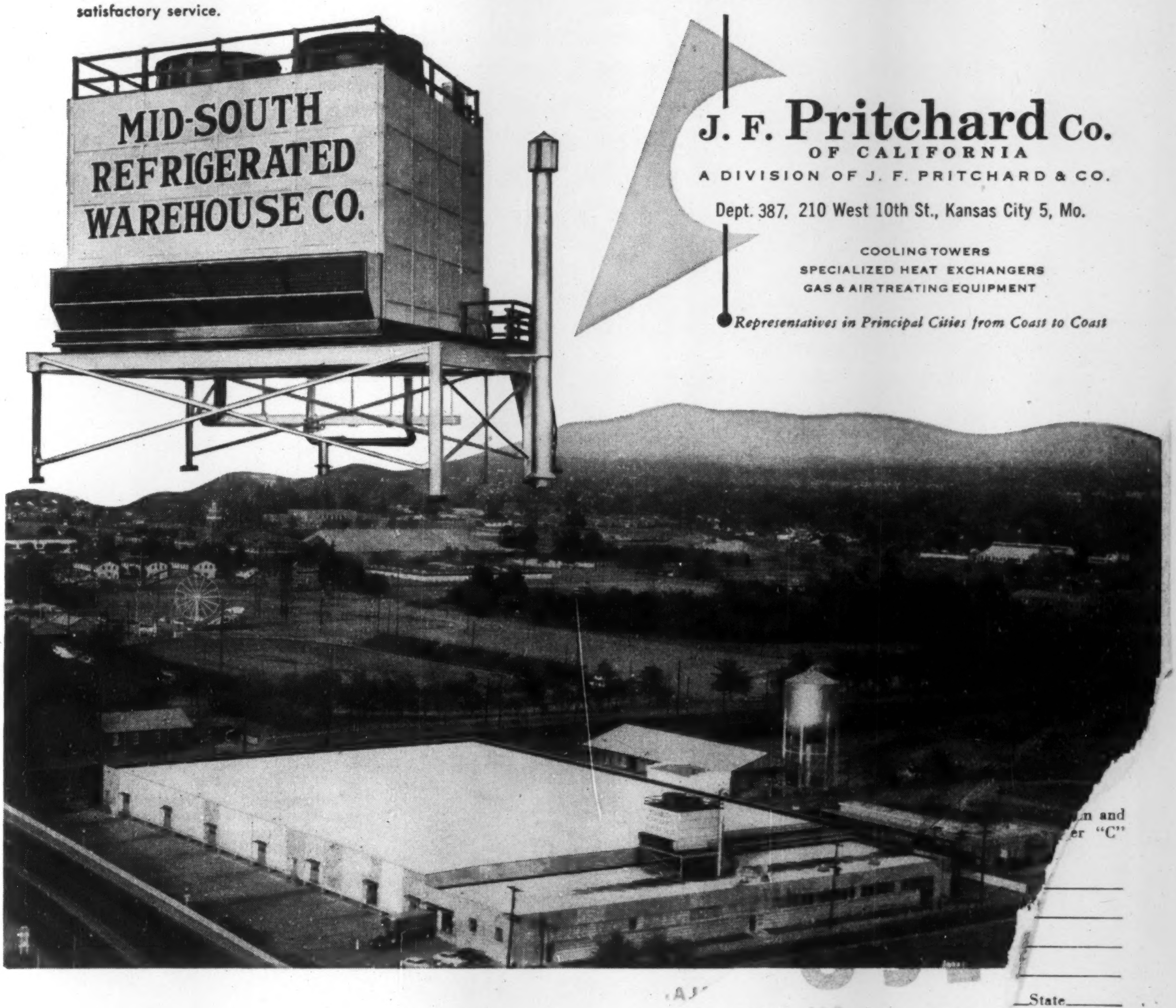
AC-1315

COLD FACTS

You want *dependable* refrigeration. Then depend on Pritchard heavy-duty cooling towers! Why? Because every Pritchard tower is guaranteed to meet your exacting refrigeration or comfort cooling requirements. Pritchard can give such a guarantee because it never recommends or builds a tower that is not adequately sized, accurately engineered and carefully constructed. Next time you want the *right* answer to your cooling problems, contact Pritchard — a founder member of the Cooling Tower Institute.

Industry's Partner for Progress

Pritchard-built for continuous, satisfactory service.



J. F. Pritchard Co.
OF CALIFORNIA
A DIVISION OF J. F. PRITCHARD & CO.
Dept. 387, 210 West 10th St., Kansas City 5, Mo.

COOLING TOWERS
SPECIALIZED HEAT EXCHANGERS
GAS & AIR TREATING EQUIPMENT

Representatives in Principal Cities from Coast to Coast

n and
er "C"

State

choose the valve that fits the job

instead of making the job fit the valve

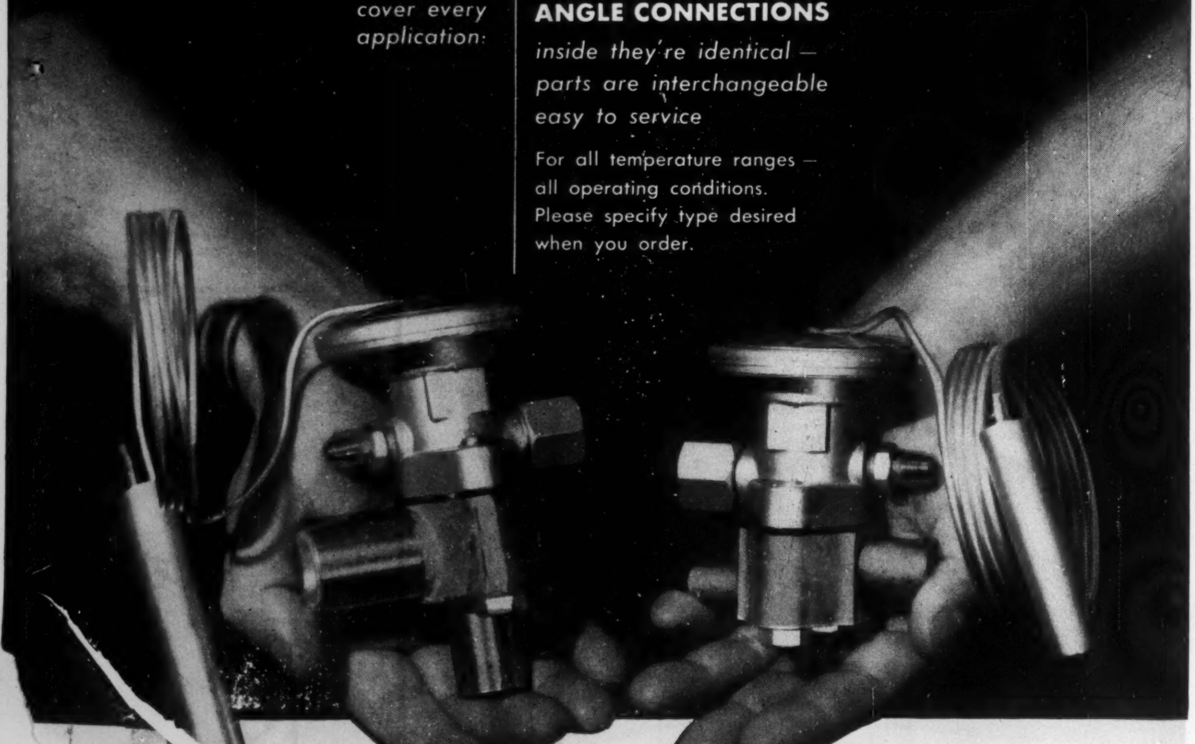
ALCO T SERIES THERMO VALVES

Two types to cover every application:

STRAIGHT-THROUGH CONNECTIONS
ANGLE CONNECTIONS

inside they're identical — parts are interchangeable easy to service

For all temperature ranges — all operating conditions. Please specify type desired when you order.



Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

CO WHOLESALER FOR BULLE TIN 171-53

ALCO VALVE CO.

861 KINGSLA ND AVE. • ST. LOUIS 5, MO.

AC-1316

IMPROVED DESIGN!
WIDER RANGE!
SPENCER
TYPE "C"
SPENCER HEATER

SPENCER "C" BOILERS

For Larger Homes, Motels, Schools, Churches, Apartments Commercial and Industrial Buildings

Capacity Range: 1100 to 5000 sq. ft. steam net rating
1760 to 8000 sq. ft. water net rating

SPENCER'S

POPULAR "C" BOILERS NOW OFFER NEW FEATURES ... NEW SIZES ... MORE ATTRACTIVE PRICES!

Now, the most popular series in Spencer's quality line of boilers is available for a wider range of jobs ... and at more attractive prices.

Improved design now makes this outstanding boiler available with standard 15″ base or extra base heights, at nominal charge, for special fuel-burning installations. Four new larger models, with heavy 3″ fire tubes, have been added to the line, providing greater range in application.

Here are some of the outstanding features of the Spencer "C" Boilers: water-cooled, precision-ground flue and fire-door frames, equipped with heavy cast-iron insulated doors; extra-heavy steel-plate smokeboxes; staggered boiler tubes for rapid heat transfer; service water-heating coils in many capacities.

Entire boiler line available with attractive standard jackets, insulated with glass wool, with beautiful blue-gray hammerloy finish.

Any fuel can be fired in the Spencer "C" Boilers. Easily and quickly converted from hand to automatic firing.

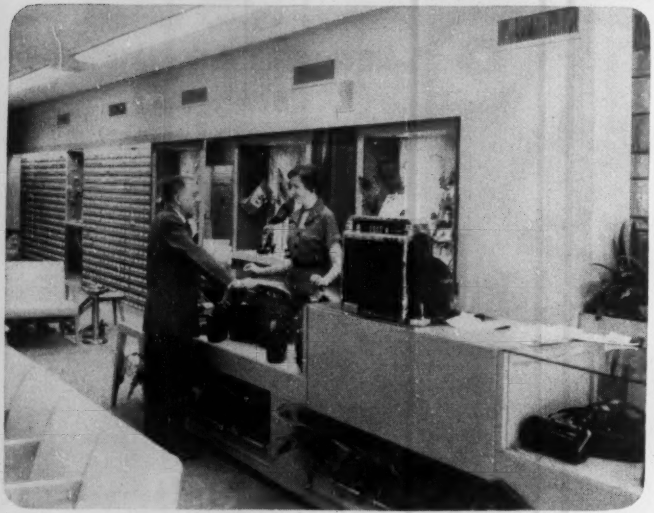
For any job—residential, industrial or commercial—requiring 1100 to 5000-sq.-ft. net load steam, low pressure, specify one of Spencer's "C" Series. *Save dollars and provide the highest quality heating plant available.*

SPENCER
HEATER
LYCOMING DIVISION
WILLIAMSPORT AVCO PENNSYLVANIA

Spencer Heaters—Dept. HP-44
Lycoming Division
AVCO Manufacturing Corp.
Williamsport, Pennsylvania

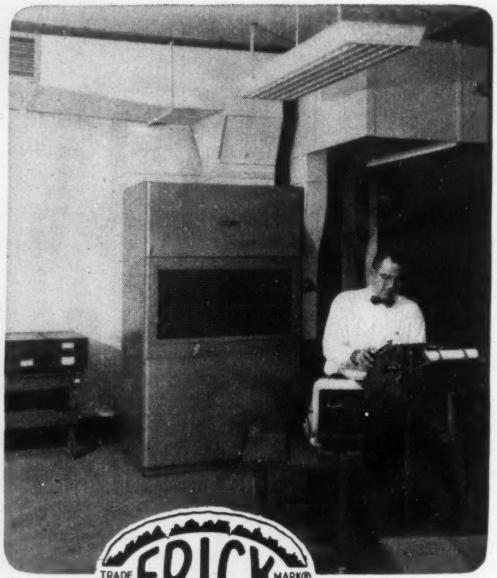
Dear Sirs:
Please send additional information and specifications on the new Spencer "C" Series Boilers to:

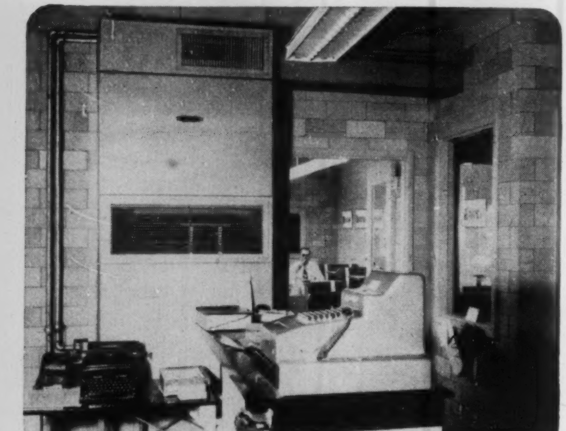
Name____________________
Position____________________
Company____________________
Address____________________
City________Zone______State______



This Shoe Store Rings-up More Sales Since the 5-hp. Frick Unit Air Conditioner and Duct System Shown were Installed.

At right: One of Four Frick Unit Conditioners Serving the Bankers Trust Company at Indianapolis.





3-hp. Unit Supplying Conditioned Air to the Sales Room and Offices of a Dairy Bar in Mississippi.

TRADE FRICK MARK®

Air Conditioning Will Help Any Business (Yours Included) Add-up More Profits—

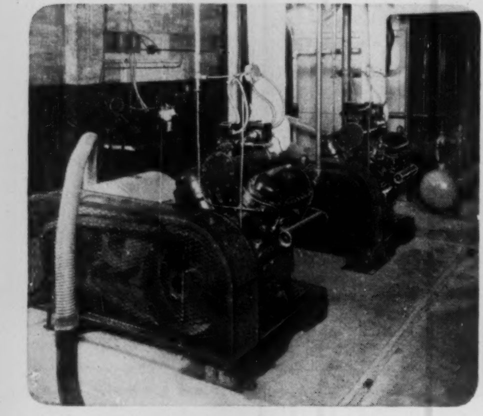
By drawing more trade, getting customers to stay longer, and keeping your staff more alert, more loyal.

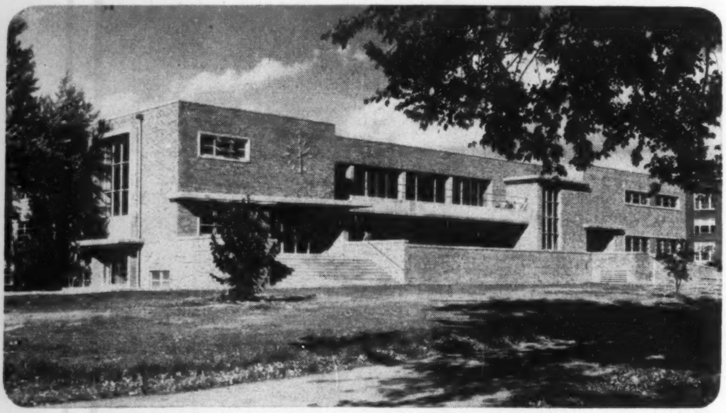
Whether you are a distributor or a user, Frick air conditioning will meet your requirements completely. We build packaged units in three sizes, and central systems of many types. Frick engineers are unbiased in recommending the exact equipment you need.

Get in touch with the nearest Frick man today. Branch Offices in principal cities: good territories for dealers still available.

DEPENDABLE REFRIGERATION SINCE 1882
FRICK CO.
WAYNESBORO, PENNA. U.S.A.

Below: Two 6-cyl. Frick "ECLIPSE" Compressors and Auxiliary Equipment Provide 120 tons of Refrigeration for Air Conditioning the New Student Union Building at Kansas State Teachers College, Pittsburg, Kansas.

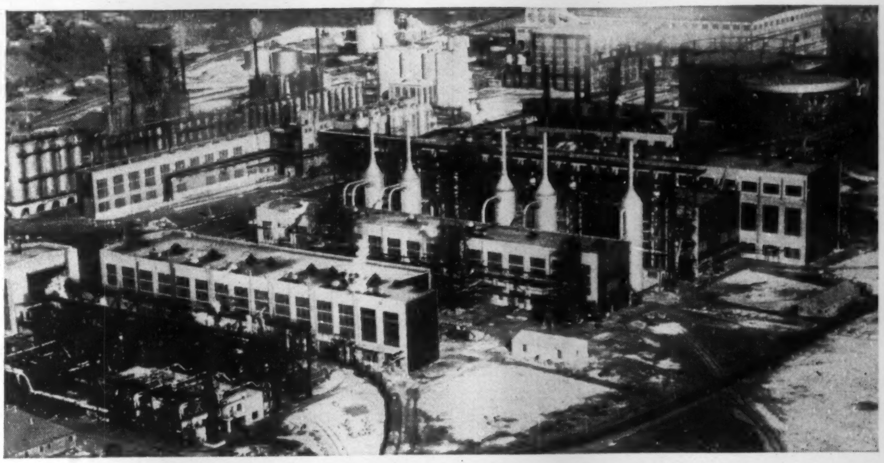




Oh, I see

Nitrogen Division's South Point, Ohio plant where ARCADIAN 12-12-12 Fertilizer, Ammonia, Urea, Nitrogen Fertilizer Solutions, Formaldehyde and other chemicals are produced.

Nitrogen Division's Hopewell, Virginia, plant where ARCADIAN Nitrate of Soda, Ammonia, Nitrogen Fertilizer Solutions, Ammonium-Nitrate-Limestone and other chemicals are produced.



... they're using our valves at the *Nitrogen Division*

ALLIED CHEMICAL & DYE CORPORATION

Chemical processors must be particular about the valves they buy. The success of a plant's operations can depend on the efficiency of the valves controlling the production flow.

Design of OIC Valves is based on the strict specifications of chemical processors. That's why OIC has gained ready acceptance by the Nitrogen Division of Allied Chemical & Dye Corporation and others in the industry. You can rely on OIC Valve dependability in your industry, too.

Write for catalog information or engineering assistance.

THE OHIO INJECTOR COMPANY • WADSWORTH, OHIO

OIC
FOUNDED 1883

VALVES | **FORGED & CAST STEEL, LUBRICATED PLUG, BRONZE & IRON**

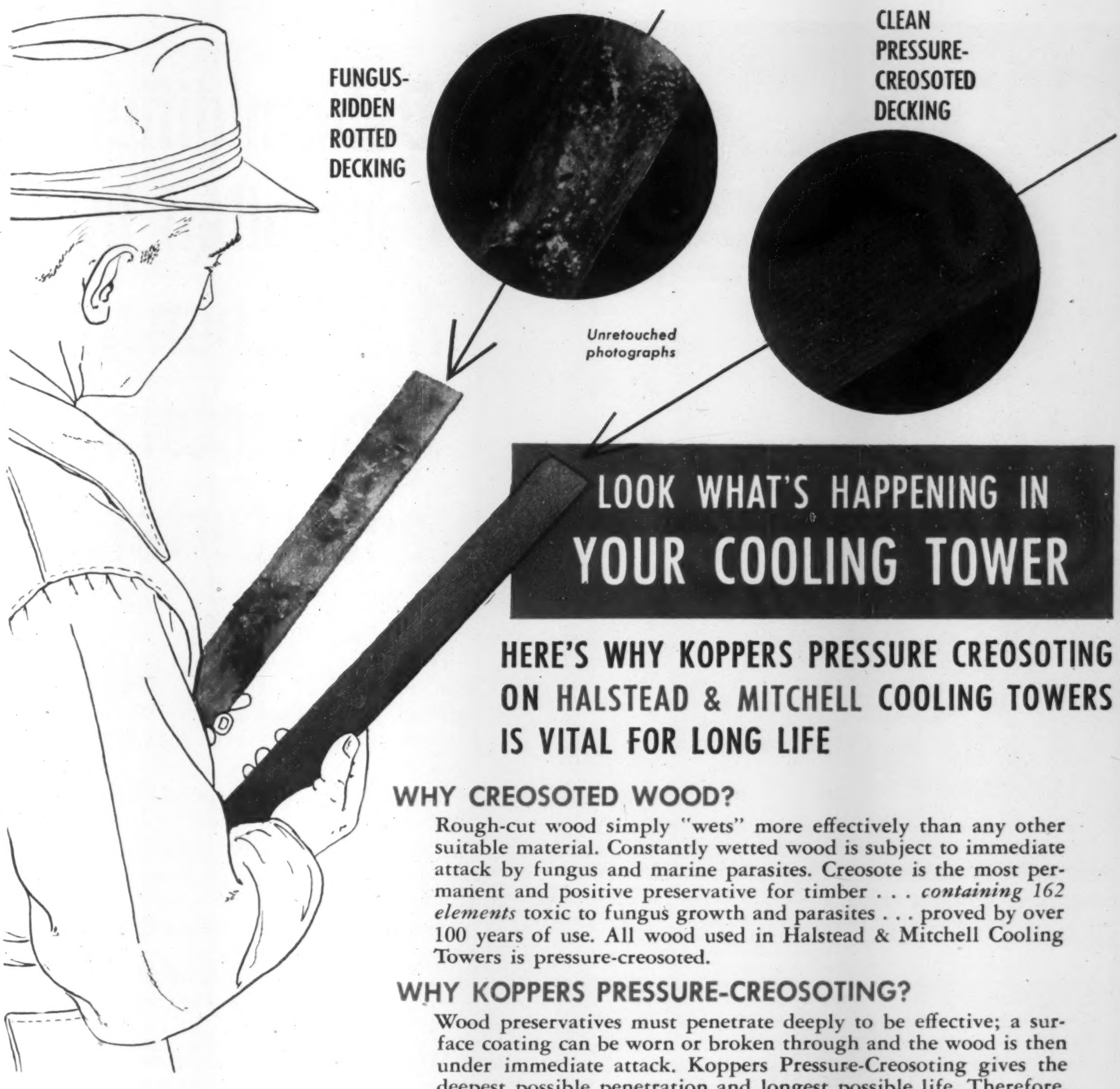
but important in your air conditioning plans

Here's a little circulating pump that can play an important part in home air conditioning systems. Built integrally with its own fractional horsepower motor, it delivers 20 to 30 gallons per minute at 50 p.s.i. It's comparatively new, but already this Fairbanks-Morse Fig. 5552B Builtogether Pump has achieved wide acceptance, particularly as a circulating pump in home cooling towers. There are many other applications where this dependable, top-quality pump can be of service.

Why not check it for your needs. For complete information, see your local Fairbanks-Morse Branch, or write direct to Fairbanks, Morse & Co., the world's largest manufacturer of a complete pump line, 600 South Michigan Ave., Chicago 5, Ill.

FAIRBANKS-MORSE
a name worth remembering when you want the best

PUMPS • SCALES • DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY • RAIL CARS • HOME WATER SERVICE EQUIPMENT • FARM MACHINERY • MAGNETOS


FUNGUS-RIDDEN ROTTED DECKING
CLEAN PRESSURE-CREOSOTED DECKING
Unretouched photographs

LOOK WHAT'S HAPPENING IN YOUR COOLING TOWER

HERE'S WHY KOPPERS PRESSURE CREOSOTING ON HALSTEAD & MITCHELL COOLING TOWERS IS VITAL FOR LONG LIFE

WHY CREOSOTED WOOD?

Rough-cut wood simply "wets" more effectively than any other suitable material. Constantly wetted wood is subject to immediate attack by fungus and marine parasites. Creosote is the most permanent and positive preservative for timber . . . *containing 162 elements* toxic to fungus growth and parasites . . . proved by over 100 years of use. All wood used in Halstead & Mitchell Cooling Towers is pressure-creosoted.

WHY KOPPERS PRESSURE-CREOSOTING?

Wood preservatives must penetrate deeply to be effective; a surface coating can be worn or broken through and the wood is then under immediate attack. Koppers Pressure-Creosoting gives the deepest possible penetration and longest possible life. Therefore, Halstead & Mitchell wetted decks are Koppers Pressure-Creosoted.

ONLY HALSTEAD & MITCHELL OFFERS THE

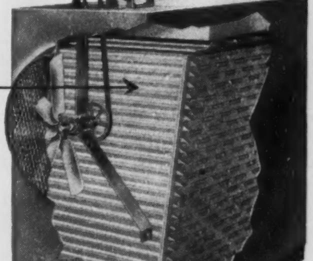
20-Year Guarantee!

ON THE WETTED DECK SURFACE

against rotting by fungus attack

2 thru 100 Tons

Sheet-Steel Cabinets,
3-times protected
Stainless Steel Fans and Shafts
Weather Shielding
Gravity-Type Distributing Pans
—no windage loss
Everdur Bolts for ease of
disassembly at any time.

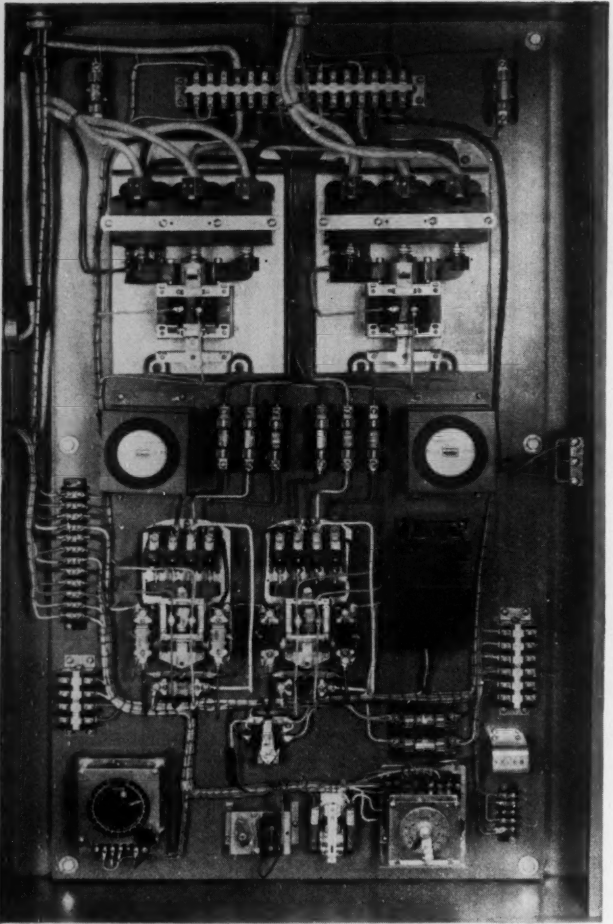


Write for Catalogs

HM

Halstead & Mitchell

OFFICES: Bessemer Bldg., Pittsburgh 22, Pa.



INTERIOR OF CONTROL PANEL shows two Ward Leonard three-pole contactors (near top of photo) and two motor starters (lower half of photo).

Dehumidifier controlled by Ward Leonard contactors and starters

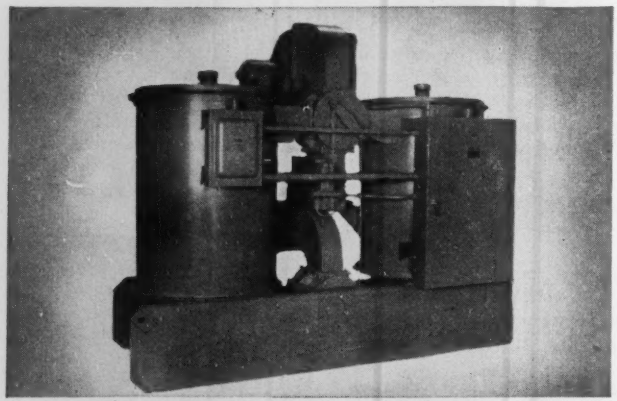
Two Ward Leonard three-pole solenoid contactors and across-the-line starters are an integral part of the control panel of the Desomatic Model DOR-800 Adsorbent Dehumidifier.

Daly, Merritt & Sullivan of Falls Church, Virginia, who manufacture the dehumidifier, needed electrical control components that could be readily installed in a custom control assembly.

The Ward Leonard contactors and starters which they selected fit this requirement because both are self-contained units . . . this results in simplified assembly, fast mounting and easy wiring.

Whatever the electrical requirements of your product, our engineers will be glad to help you select dependable controls to meet them. Write to Ward Leonard Electric Company, 24 South Street, Mt. Vernon, N. Y.

3-35



DESOMATIC DEHUMIDIFIER is used for preservation of equipment during long storage in warehouse buildings.

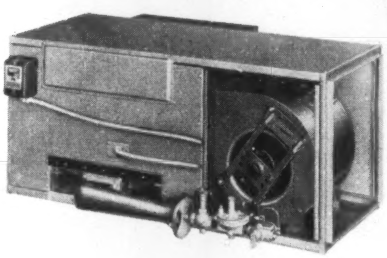
WARD LEONARD
ELECTRIC COMPANY
MOUNT VERNON, NEW YORK

RHEOSTATS RELAYS RESISTORS CHROMASTER

Result-Engineered Controls Since 1892

Ward Leonard's complete engineering textbook, "Handbook of Power Resistors," $3. per copy.

tucked
away for
perfect
warmth



UTILITY'S HORIZONTAL FORCED AIR FURNACES

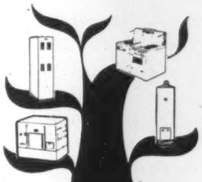
Even on jobs where floor space is extremely limited, you can offer your customers all the advantages of forced air heating. Utility's compact Horizontal Forced Air Furnaces fit under the house, in the attic, under the floor, under a staircase — in any out-of-the-way place — to save precious floor space.

Utility's patented, resilient-mounted blowers insure efficient, vibration-free operation.

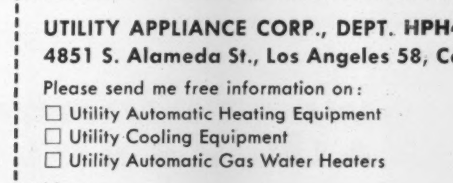
Automatic controls, trouble-free design assure you of fewer service call-backs, greater customer satisfaction. AGA-approved. Guaranteed in writing for 10 years. 65,000 – 90,000 – 115,000 – 140,000 BTU.

In small homes, or in remodeling jobs, these easy-to-install, low-cost Utility Horizontal Forced Air Furnaces meet competitive conditions . . . make it easier to "sell the job."

GAFFERS & SATTLER
AND OCCIDENTAL
AUTOMATIC GAS RANGES
UTILITY
FURNACES
AIR COOLERS
WATER HEATERS



a happier living family tree . . .
all branches of



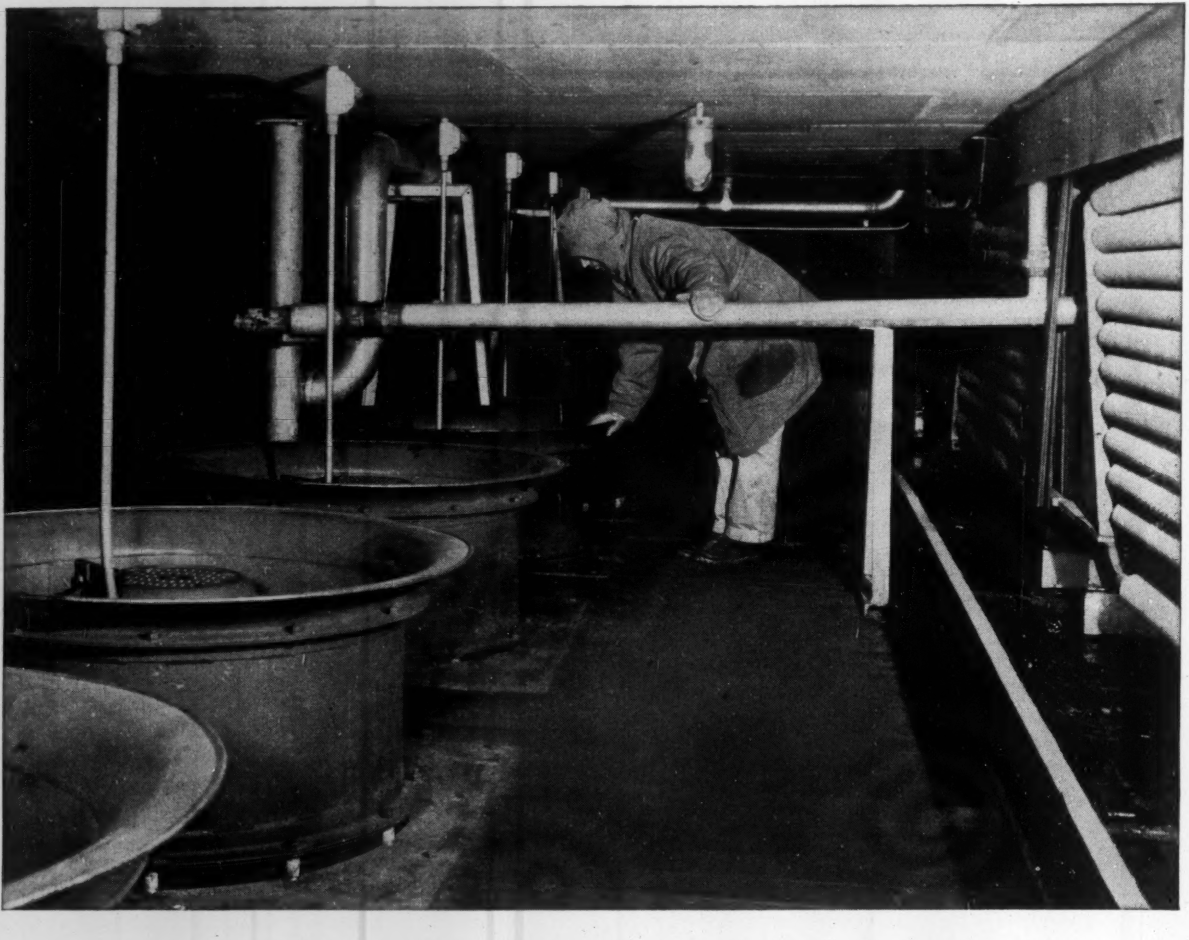
see the complete UTILITY heating line now

UTILITY
TRADE MARK

Guaranteed heating performance

UTILITY APPLIANCE CORP., DEPT. HPH4
4851 S. Alameda St., Los Angeles 58, Calif.

Please send me free information on:
☐ Utility Automatic Heating Equipment
☐ Utility Cooling Equipment
☐ Utility Automatic Gas Water Heaters
Name________________________
Address________________________
City____________ Zone____ State________



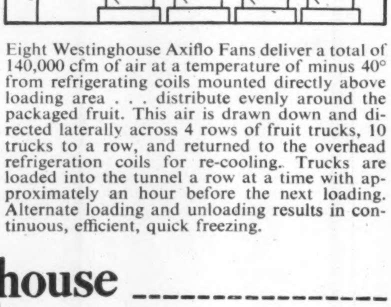
HOW WESTINGHOUSE FANS QUICK-FREEZE BERRIES TO MINUS 40°

When the berry packing season starts in Whatcom County, Washington . . . huge (110 ton capacity) freeze tunnels require fast, efficient air movement at 40° below zero . . . operating night and day for 3 solid months.

Baker Cold Storage Company called in the local Westinghouse-Sturtevant sales engineer and found that Westinghouse had the answer.

The result: eight Westinghouse-Sturtevant Axiflo Fans cold-blast the packaged fruit with 140,000 cubic feet of air per minute. This air moving system was originally guaranteed to freeze 46 tons per day . . . now handles 100 tons in a 24 hour day. Westinghouse fans have handled this grueling task with never a let-up for the past 8 seasons.

Whatever your problem in putting air to work, you will find the Westinghouse-Sturtevant sales engineer the most capable man to contact. Call your local Westinghouse-Sturtevant office or write Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Massachusetts.



Eight Westinghouse Axiflo Fans deliver a total of 140,000 cfm of air at a temperature of minus 40° from refrigerating coils mounted directly above loading area . . . distribute evenly around the packaged fruit. This air is drawn down and directed laterally across 4 rows of fruit trucks, 10 trucks to a row, and returned to the overhead refrigeration coils for re-cooling. Trucks are loaded into the tunnel a row at a time with approximately an hour before the next loading. Alternate loading and unloading results in continuous, efficient, quick freezing.

WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE... IF IT'S **Westinghouse**

COPELAMETIC

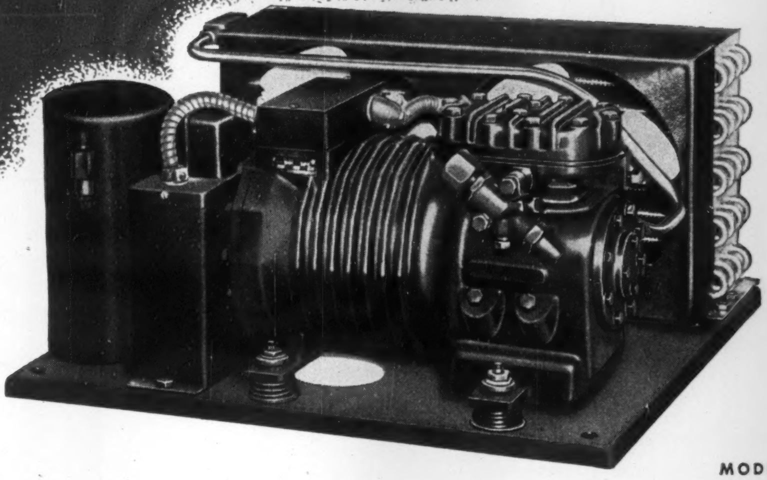
THE *Accessible* HERMETIC

compact . . .
dependable . . .
quiet . . .

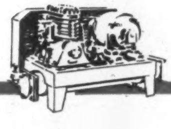
Compact . . . dependable . . . quiet. Those are the prime requirements for the refrigeration unit in any air conditioning system. Add to them ruggedness, accessibility and long life and you have the COPELAMETIC.

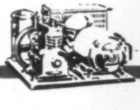
For the unit that has everything, look to Copeland the pioneer. Practical-minded engineers designed this modern unit without belts, seals or manual oiling, and to top that they made it accessible for servicing on the spot. Specify COPELAMETIC and be sure of a satisfied client for years to come.

There's a Copeland unit for every type air conditioning installation from smallest to largest. Air-cooled, remote COPELAMETICS are made from 1/4 thru 3 HP. There are water-cooled, remote units from 1/3 thru 7-1/2 HP. Self-contained COPELAMETICS are available for all applications. For complete details, write us or call your refrigeration dealer.



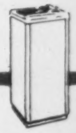
MODEL DE-100 ILLUSTRATED



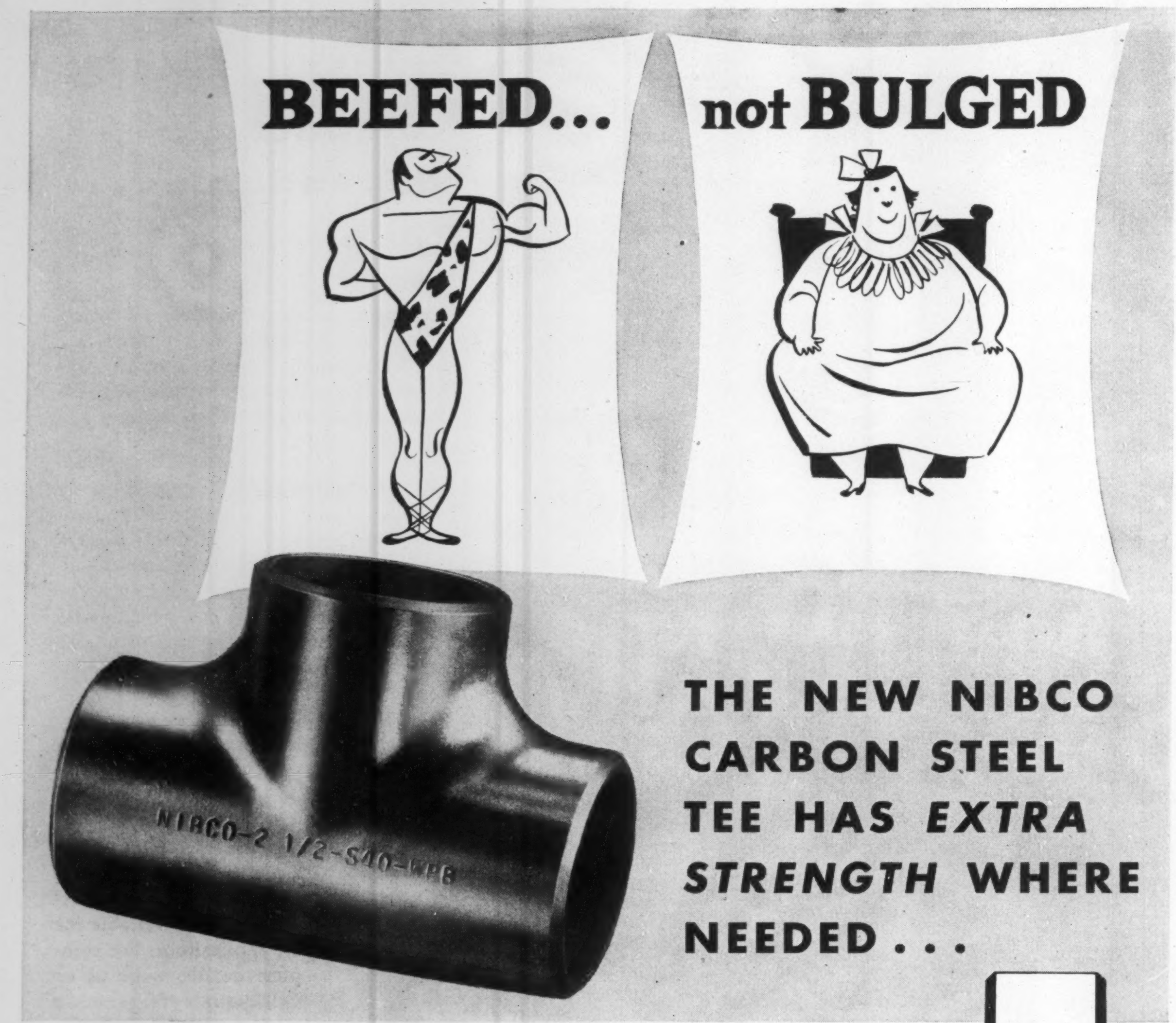


REFRIGERATION UNITS (OPEN - TYPE AND COPELAMETIC) WATER COOLERS

Copeland
DEPENDABLE *Electric* REFRIGERATION



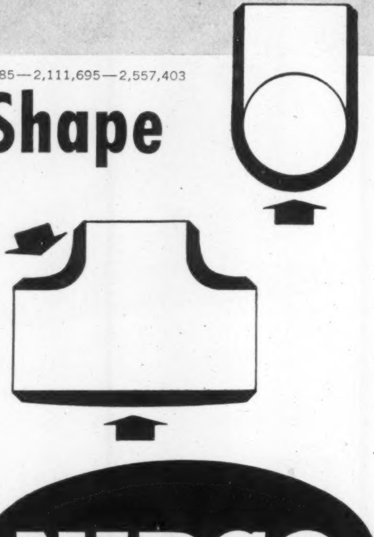
COPELAND REFRIGERATION CORPORATION • SIDNEY, OHIO



THE NEW NIBCO CARBON STEEL TEE HAS *EXTRA STRENGTH* WHERE NEEDED . . .

U.S. PATENTS 2,027,285—2,111,695—2,557,403

Look for the BRAWNY Shape



Clue to the quality of the NIBCO Carbon Steel Tee is the distinctive "BRAWNY" shape. But you really need to look inside to see that this tee is beefed; not bulged. There's extra wall thickness where extra strength is needed. NIBCO's exclusive forming process creates a denser grain structure that also makes the tee stronger and more resistant to corrosion. The beautiful cold-formed finish and the unrestricted passages inside the fittings add to the superior performance of NIBCO "BRAWNY" Carbon Steel Welding Tees. You can get them through your regular source of supply.

NORTHERN INDIANA BRASS COMPANY
471 Plum Street, Elkhart, Indiana

NIBCO

An Announcement
of Importance
to Everyone in the
Engineering Field
A-2055
CARTRIDGE UNIT
FLANGE UNIT
SEALMASTER
LUBRICATED AT PLANT
and
SEALED FOR LIFE!
REDUCE NOISE VIBRATION WEAR
SEALMASTER

SEALMASTER'S *New* Rubber Mounted-Zone Hardened

BALL BEARING UNITS

REDUCE NOISE, VIBRATION AND WEAR!

Here's new proof that the real advances in design and engineering come from SEALMASTER! This new Rubber Mounted, Zone Hardened Ball Bearing Unit — another SEALMASTER patented exclusive — is now in full production.

Any manufacturer interested in quieter operation and smoother performance for his product will find the answer in this new bearing unit. Designed to reduce noise and vibration — a Zone Hardened SEALMASTER Ball Bearing Unit is mounted in a synthetic, oil-resistant rubber ring which fits snugly into a pressed steel housing — pillow block or flange type. Cartridge units are also available for insertion in special and built-in housings. Whether your product is on the drawing board or the production line, you'll want further information about the features of this new bearing unit.

SEALMASTER

BALL BEARING UNITS

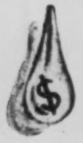
Bulletin 1253 gives full information on the SEALMASTER Rubber Mounted line. Write for it today!

SEALMASTER BEARINGS A DIVISION OF STEPHENS - ADAMSON MFG. CO • 47 RIDGEWAY AVE., AURORA, ILL.

Little Drops of Water (Condensation) Ruined a Fine Home--- Cost over a Million Dollars to an Apartment Development

They thought they would move their fine country home to a new site. The state highway was coming through. They could not! Account of condensation inside the walls, the sills had rotted away.

The owners of a path-breaking apartment house development in a great city had to pay a repair bill of more than a million dollars for ripping out condensation-soaked insulation and replacing damaged, plaster walls.



Today's tightly-built, high humidity houses create new problems of vapor pressure and vapor retention within. Sometimes excessive flow of vapor into building spaces occurs, and the formation of destructive condensation is enhanced, where a vapor barrier is lacking from the insulation or there is one with too many breaks in it, or one which while waterproof is not vapor-proof.

But there now is a new multiple accordion aluminum which forms a continuous, edge-to-edge blanket of uniform depth between studs or joists, giving the entire area maximum protection against condensation formation as well as against heat loss or intrusion.

Multiple accordion aluminum's surfaces have high radiation or heat ray reflectivity (97%); low absorptivity (3%); and low emissivity (3%). Conduction is low because of preponderant air spaces of low density. Aluminum and fiber layers retard convection, outer and inner.

The aluminum sheets, 500 ft. and 750 ft. long, are impervious to water vapor. Infiltration under the flat, stapled flanges is slight. Condensation formation on or within this type of insulation is minimized by the scientific construction of multiple layers of accordion aluminum, fiber and air spaces. The commercial form of multiple accordion aluminum is Infra Insulation, Types 6-S*i* and 4-S*i*.

The U.S. NATIONAL BUREAU OF STANDARDS has prepared an interesting study of moisture CONDENSATION in walls of dwellings. Obtain a copy at our expense by using coupon.

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525 Broadway, N.Y.C., Dept. H-4
Please send ☐ Samples of Infra ☐ N.B.S. pamphlet "Moisture Condensation in Building Walls."

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in new construction between wood joists, material with labor,

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THE EDITORS' PAGES

• *IT MAKES A WONDERFUL impression — when you're giving a talk at an engineering meeting — if you have slides that can be easily seen and read by everyone in your audience. The effectiveness of a good talk on an important subject has too often been impaired by poor slides. If you have to say to your audience "I don't think you all will be able to read this chart" . . . . it's our opinion you ought to toss that one in the nearest wastebasket.*

'54 Figures Indicate Record Building Boom

. . . first two months up 13%

DODGE REPORTS of contracts awarded for future construction projects in the 37 eastern states smashed several records for dollar volume in February, according to the F. W. Dodge Corp. The totals set an all-time high for any February in the 63 year history of the reports. The gross figure was $1,221,260,000, up 7 percent over the previous February high set in 1951, and 20 percent ahead of February 1953. The totals also were 6 percent greater than in January, contrary to the usual tendency of totals to drop off slightly in February.

Combined with the surprisingly strong January contract awards, they set an all-time high for the January-February figures, being 9 percent ahead of the previous January-February high set in 1951, and 13 percent greater than the first two months of 1953, which started a record-breaking year.

They also set all-time high January-February totals in all three major classifications — nonresidential, residential, and public works and utilities.

"Study of the details of the figures reveals that they are well balanced and with only a usual percentage of the very large single engineering projects," said Thomas S. Holden, vice chairman of Dodge.

"I agree with a statement by the prominent editor and columnist, David Lawrence, that 'There's something dynamic happening to the American economy right now,' and with his further statement that 'the facts are that the latest statistics on construction are sensational in their revelation of an unprecedented building boom.'

"It is of the highest significance that the reports out of which we make up our totals are reports of future construction, not past construction," he said. "They are actual projects that are in the first stage of construction, or that are about to get under way.

"They indicate high future employment of labor and high future sales of materials in one of the nation's basic industries."

Individual two-month 1954 award totals compared with the like period in 1953 were: nonresidential, $941,789,000, up 21 percent; residential, $971,255,000, up 11 percent; heavy engineering $460,203,000, up 5 percent.

Individual February awards were: nonresidential, $468,712,000, down 1 percent from January but 25 percent above February 1953; residential, $508,773,000, up 10 percent over January and 22 percent above February 1953; heavy engineering, $243,775,000, up 13 percent over January and 7 percent above February 1953.

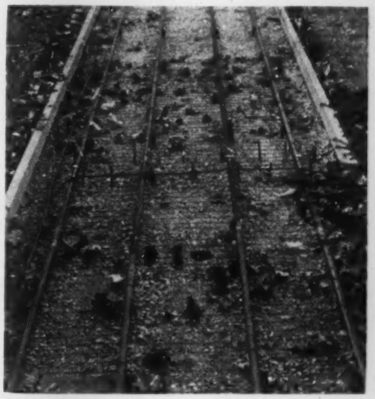
IBR Installation Studies Snow Melting

. . . in sidewalk, driveway

STUDIES ON THE cost and the operation of a snow melting system are now being carried on at the IBR research project at the University of Illinois, Urbana.

Coils were installed under a sidewalk and under a driveway, with 175 thermocouples imbedded in the concrete when it was poured. The thermocouples are located so as to provide a temperature traverse clear across the driveway and across the sidewalk.

In the construction of the driveway, the pipe coils are arranged on 12 in. centers directly under each tire tread.



SIDEWALK SNOW MELTING installation has piping arranged so that there is 15 in. between the two center pipes and 12 in. between the others. In the sidewalk, reinforcing mesh is directly under the pipes for the first third of the walk and directly on top of the pipes in the last third. No reinforcing mesh is used in the middle third

In the sidewalk installation, the pipes are arranged so that there is 15 in. between the two center pipes and 12 in. between the others. The sidewalk slab is 5 in. thick with the pipes so located that there is 2 in. of concrete covering the top of the pipes and approximately 2 in. of concrete between the pipes and the gravel fill.

All the coils in the sidewalk as well as the driveway are $3/4$ in. black iron pipe. They are joined to a common supply and return made of $1\frac{1}{4}$ in. pipe.

Office Buildings, Shopping Centers Lead Boom

. . . construction up, says C. of C.

COMMERCIAL construction this year is due for a boost of at least 10 percent above last year's peak of $2.2 billion, the Chamber of Commerce of the United States reports.

Capital outlay for office buildings, loft buildings and warehouses, as a group, can be expected to total 15 percent greater than in 1953, while expenditures for stores, restaurants and garages are forecast to be at least 5 percent more, according to the chamber.

If to these main classes of commercial construction are added hotels, motels and commercial recreation buildings, the 1954 total will reach $2.4 billion, the chamber points out.

Two features characterize the current boom — office buildings and shopping centers. [Editor's note — Invariably air conditioned.] In New York City, nearly six million additional square feet of office space is under construction or in prospect. Pittsburgh, a pioneer in the new office building era, still has plans ahead. Boston, Philadelphia and Chicago are all busy with new structures, while construction is under way or planned in Baltimore, Washington, Atlanta, Dallas, Houston, Denver, Los Angeles, San Francisco.

Among the largest shopping centers projected for 1954, are the great Skokie Center, northwest of Chicago, and the Northland Center [see September 1953 HPAC] ajoining Detroit, now nearing completion. Construction of shopping centers generally has been stimulated by the dispersion of new housing since the war, together with the vast increase in autos in recent years.

"Quote"

"The principle of energy released by nuclear fission was unknown before 1939 and was discovered in connection with completely abstract researches on the nature of atomic structure. There was no practical experience which could be combined with this scientific discovery because nuclear reactions do not occur on the earth's surface in noticeable degree.

"The layman might suppose that only the central idea was novel and that putting it to work was a job for men with practical experience. This was partly true, but not so much as you might think. Let me talk about some of the practical problems of building a plant such as the one at Hanford, Wash. Let me take two illustrations, both of which would appear to be familiar problems from the engineering point of view. The process of nuclear fission which was to occur on a large scale in the Hanford reactors releases enormous amounts of heat. This heat had to be removed from the reactor in some way. Certainly, the design and construction of a cooling system appears to be a straightforward engineering problem. As it turned out at Hanford, the new requirements imposed on such a cooling system by the nature of the nuclear processes going on in the reactors required extensive modifications of the normal technology for cooling systems. Neither copper, nor iron, nor lead, nor stainless steel piping could be used. The presence of any one of these materials in the reactor would prevent the reactor from working. From the nuclear physics point of view zirconium or beryllium would have been ideal. Neither zirconium nor beryllium piping existed, nor was it possible to develop it for use on the scale that was required.

"It turned out that aluminum could be used but that the aluminum pipes had to be thin. Not very much was known about the corrosion of aluminum when hot water was running through it, and nothing was known about the effects of the nuclear radiation on aluminum. Consequently, before the plant could be designed and built it was necessary to make many tests on properties of aluminum piping.

"The chemical plant was to process large amounts of uranium and to remove from it minute quantities of plutonium. Uranium had been known for many years but had never been produced in quantity before nor processed chemically on any major scale. Plutonium was a totally unknown chemical element first discovered in 1939. Furthermore, materials to be processed in the plant were highly radioactive and, therefore, the whole plant had to be designed for remote control to protect the operating personnel. And it had to be further recognized that the presence of radioactive radiations might affect chemical processes just as the presence of similar irradiations affected the corrosion of aluminum.

"Evidently the solution of both of these problems and a host of others that were present required the cooperation of engineers with practical experience and scientists who were familiar at least on a laboratory scale with the new effects that were involved." — *Henry De Wolf Smyth, in remarks on the future of research and development at a meeting of the graduate council of Princeton University.*

'54 To Separate "Stallers from Installers"

. . . OHI president says

PAUL K. ADDAMS, president of the Oil-Heat Institute, in addressing a recent joint meeting of the board of directors and other members of the OHI, called for more intensive selling this year.

"The year 1954 will be what we make it," Mr. Addams said. "It is definitely a year for more intensive selling — a year that will separate the stallers from the installers," he said.

R. H. L. Becker, OHI's managing director, said that 1953 was the third biggest year in the history of the industry, and that "there is no reason why 1954 should not be as good or better than 1953."

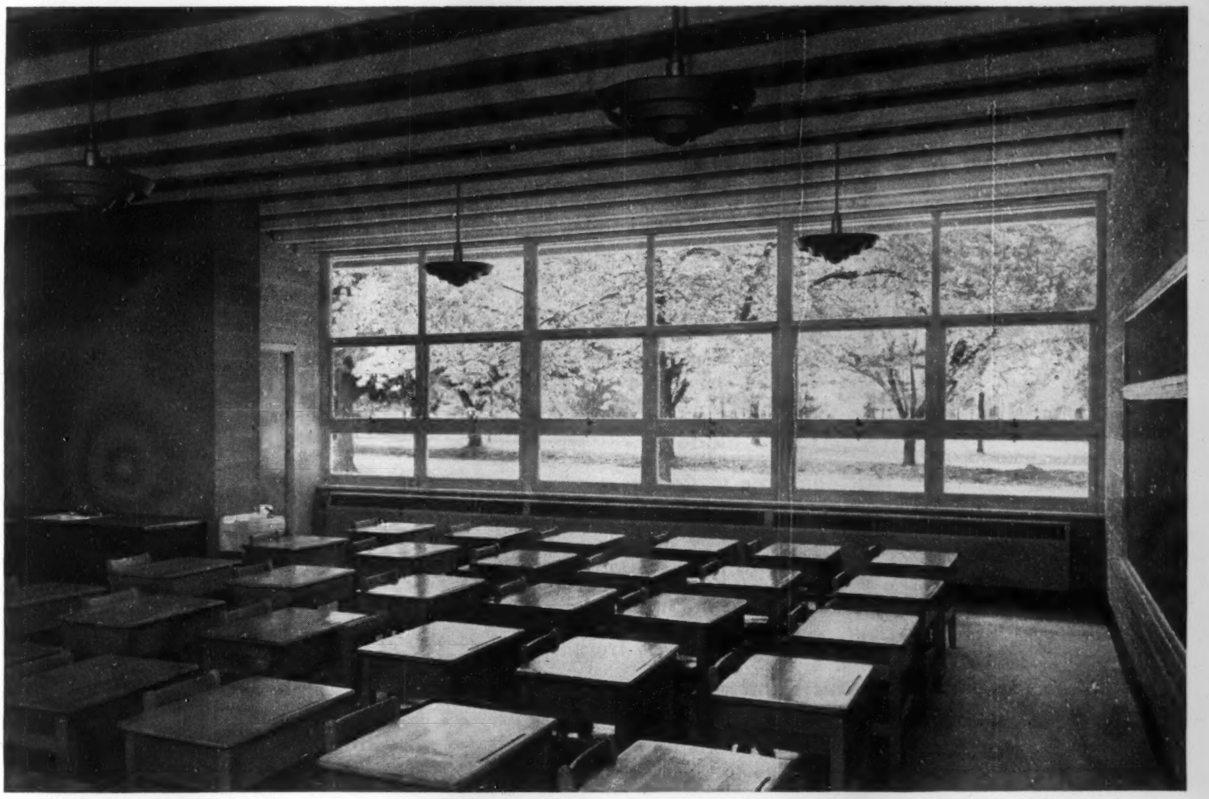
The commercial-industrial burner manufacturers had "an exceptionally fine year in 1953" with shipments of 42,484 burners, or 12 percent over the previous year, he said. They expect a slightly better year than the last one, particularly in commercial, school, hospital and industrial work, he reported.

Air Pollution Control Award Established

. . . honors Frank Chambers

AN AWARD recognizing an individual's efforts to advance the technique, art or science of air pollution control was established at a meeting of the board of directors of the Air Pollution Control Association held at its executive offices at Mellon Institute, Pittsburgh. It is to be known as the Frank A. Chambers award, in honor of his advocacy of the "engineering approach" to air pollution control problems.

Mr. Chambers was one of the first technical engineers employed as head of a smoke control bureau and served in this capacity in Chicago for over 40 years.



Classroom in Wakelon Public School, Zebulon, N. C. Architects: Page & Smith, Raleigh, N. C. Heating Contractor: Bullock & Proctor, Raleigh, N. C.

Schools by Page & Smith Use Webster Tru-Perimeter Heating

Wakelon Public School is typical of the modern, low cost schools in North Carolina designed by Page & Smith, Raleigh, and using Webster Steam Heating Equipment.

Examine this pleasing interior. Note the wall-to-wall installation of Webster Walvector blanketing the entire window area and concealing all piping. Tru-Perimeter Heating with Webster Walvector spreads gentle, even heat along cold perimeter walls – offsets heat loss beneath windows – provides draft-free comfort with window ventilation.

Wakelon School has 12,914 sq. ft. of floor space, 6 rooms and cafeteria, built in 1952 at a total cost of $127,000. Heating contract was $11,585 or 9 per cent of the total construction cost.

Webster Tru-Perimeter Heating for Schools uses Webster Walvector to replace the heat at the perimeter where heat loss occurs. Heating elements mounted close to the floor spread heat the entire length of exposed walls, warm the air in the room, the floors, and the inside surface of outside walls. Gently moving warmed air is drawn to floor level and across the floor into the inlet opening of the radiation.

Webster Tru-Perimeter Heating results can be obtained with either forced hot water or Webster Moderator controlled low-pressure steam heating which varies heating automatically with outdoor temperature. Steam circulation is facilitated with Webster Traps and Valves. The rugged single unit Webster Moderator Control involves minimum maintenance cost – no blowers or fans, no buried piping, no useful floor space taken.

Look into Webster Tru-Perimeter Heating for *your* school. Call the Webster representative or write us.

Address Dept. HP-4

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Webster
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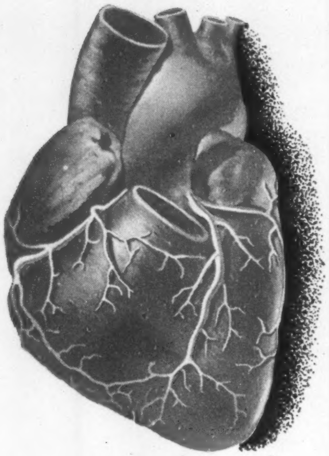
REG. U. S. PAT. OFF.
For Steam or Hot Water Heating

DID YOU EVER SEE YOUR HEART?



Manifestly not; but you know you *have* one and you *wouldn't be without it!*

The heart of a heating, ventilating, air-conditioning or processing system is the heat transfer surface—hidden away from view, but indispensable to system results. Look at the Pentagon, or the United Nations building. Go inside and note the comfortable air conditions. Search for the heart. You can't see it; but it's there—away from sight, behind ducts and piping; the heat transfer surface so vital to the cleaning, heating, cooling of the air. And it is NESBITT SURFACE.

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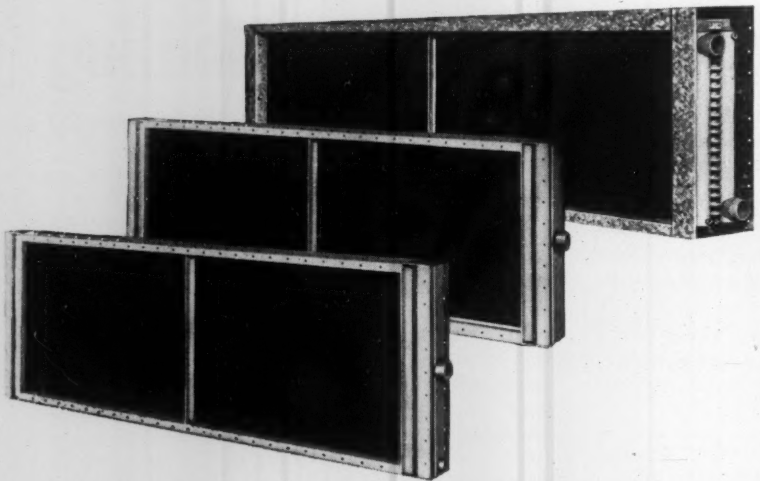

W **SERIES W**—Continuous or cleanable-tube surface for cooling, dehumidifying, or heating, with water. Copper tubes; aluminum fins. Type **WD** with surface pitched within the casing and exclusive Nesbitt drainability feature for positive protection against freezing. **Type WB** for booster-heating or air-cooling where air volumes are small and drainability unnecessary. **Pub. 246. Type WC** cleanable tube sections employ standard cores pitched in the casing. Cast iron headers with removable cover plates to permit cleaning of tubes. **Pub. 255.**

H **SERIES H**—Blast coil heating surface for general heating, ventilating, air-conditioning and drying in high- and low-pressure steam systems. Copper tubes and headers, aluminum fins. Without steam-distributing tubes. Seven surface types, full size and capacity range. **Pub. 248.**

D **SERIES D**—Steam-distributing tube surface for even distribution of steam, uniform discharge temperatures, perfect controllability with modulating valves, inherent protection against freezing. Ideally suited for pre-heating outdoor air. Copper tubes and headers, aluminum fins. **Type DS**, in lengths to 6 feet, with single or dual steam-distributing tubes. **Type DD**, in lengths above 6 feet, with dual steam-distributing tubes and supply header at both ends. **Pub. 247.**

NESBITT HEAT TRANSFER *Surface*

Manufactured and Sold by John J. Nesbitt, Inc., Philadelphia 36, Pa.

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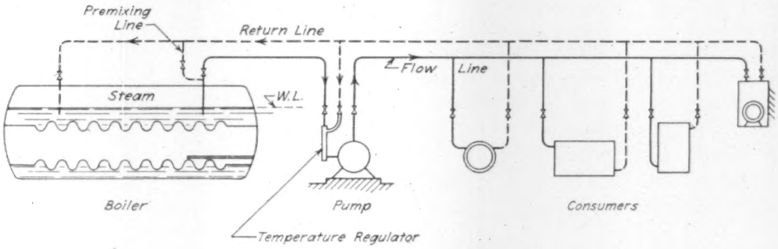
• *WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Just address your comments to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*



HIGH TEMPERATURE hot water may be pressurized by steam generated in the same boiler, as shown in this sketch (Fig. 1) repeated from Mr. Kuli's article

OWEN S. LIEBERG —

"I Would Like to Comment on HTHW"

I ENJOYED the article on high temperature hot water, by S. A. Kuli, which was published in the January HPAC. Because of considerable experience in this field, I would like to offer some comments about the article which may be of interest to others.

In the discussion about circulating pumps and returning the water to the boiler, as shown in Fig. 1 of the article and repeated here, it has been our experience that the return water should be injected into the supply water as near to the suction inlet of the pump as possible. We have found that the pump should be placed directly below the boiler expansion drum. Also, the expansion drum should be situated at least 10 ft above the boiler and 25 to 30 ft above the pump.

Mr. Kuli states that the storage capacity of the system alone generally equalizes the fluctuation of heat demands. I would have preferred to have seen the word "generally" omitted because the storage capacity invariably absorbs the fluctuation of heat demands in an efficiently designed system—OWEN S. LIEBERG, Mechanical Engineer.

THE AUTHOR REPLIES—I wish to thank Mr. Lieberg for his constructive comments. They give me an opportunity to explain some features of the high temperature hot water heating system in more detail.

In Fig. 1 the temperature regulator is simply a means for controlling the injection of return water into the suction inlet of the pump. However, flashing — due to the suction of the circulating pump — can also occur in the supply line between the boiler and the pump, especially when the available suction head is close to the minimum. Therefore, the water in the supply line itself must be cooled down by injecting a certain amount of cooler return water into the supply line as near to the boiler drum as is practical. Some engineers arrange this "premixing" inside the boiler drum by steadily injecting a certain amount of cooler return water into the supply line. If so selected, the boiler drum itself can accommodate expansion of water, and thus no separate expansion drum is needed.

It is true that the pumps should be placed as near to the boiler as is practical, to avoid long suction lines, and thus the need for a higher net positive suction head. Also, it is true that pumps must be lower than the boiler water level, because every pump handling high temperature fluids requires more or less net positive suction head. I see no reason why pumps should be placed "directly beneath the boiler expansion drum." As a matter of fact, I have seen few high temperature hot water systems where the pumps could be placed directly beneath the expansion drum. On the contrary, in many high temperature hot water heating systems, pumps are located 20, 30 or even 40 ft from the boiler, and the systems are working perfectly.

If the expansion drum is the source of water supply to the pump, then it should be as high as is necessary to secure a sufficient net positive suction head for the pump. There are, of course, pumps which require 20 to 25 ft net positive suction heads. In many cases this requirement would make the use of a high temperature hot water system prohibitive, because the average boiler house is not built 30 to 35 ft high, but if we select a pump for a low net positive suction head, we can locate the pumps on the same floor level as the boilers, because the water level in most boilers is at least 10 ft high. There are pumps available with a required net positive suction head of only 4 to 6 ft — at, for example, 380 F suction temperature. In fact, there are many high temperature hot water installations — both in Europe and the U. S. — where circulating pumps are located on the same floor level as the boilers, so that the height difference between boiler water level and pump suction inlet is only about 8 to 10 ft.

I stated that the storage capacity of the system alone generally equalizes the fluctuation of heat demands. In other words, the great volume of water in the boiler, as well as in the pipe lines, can accumulate a certain amount of surplus heat which can be used, in many cases, for absorbing sudden peak loads. However, there are cases, where the peak load is so high and the time of peak so long that the water of the system alone cannot take care of it. In such cases, the installation of a high temperature hot water accumulator is advisable.

The water volume of the system alone is not capable of absorbing all peak loads; "generally," yes — "invariably," no — S. A. KULI, Project Engineer, American District Steam Co., Inc.

M. J. MARION —

"Right Type of Steam Trap Should Be Used"

THE ARTICLE Steam Piping Must Be Drained, published in the January HPAC, was very interesting but there were one or two points that occurred to me as I read it which should be amplified.

I would like to take exception to the statement that adequate drainage may often be accomplished by manually operated drains. Manual operation is so expensive and uncertain that I would play safe and use automatic steam traps.

I would like to emphasize the right type of steam trap in these comments, because the wrong type of trap might very well cause water-logging. This condition, of course, precedes water hammer — the reason for the article. —M. J. MARION, Sarco Co., Inc.

H. L. NACHMAN —

"A.C. Capacity Increase Interested Me"

A VERY INTERESTING description of the air conditioning installation in the Harris County court house in Houston was given in the January HPAC by I. A. Naman and Jack B. Buckley.

The idea of "treated" outdoor air bypassing the chilled water cooling coils has an additional advantage beyond that of zoning control. It does not unnecessarily penalize the chilled water cooling coils in the individual units — which is one of the problems encountered by pre-conditioning outdoor air.

I was particularly interested in the description of the conversion of the centrifugal refrigeration unit from 1140 tons to 1450 tons by merely changing refrigerants. The authors make reference to a "Freon-114" *modified* system. It would be interesting to know more of the details concerning the modifications which were necessary to adapt this system for the change in refrigerants. It would be presumed that some of the modifications caused the lower efficiency that is referred to in the article. The basic thermodynamic differences between the various possible refrigerants are small compared to the differences in efficency resulting from changing operating conditions due to the already fixed equipment sizes.

It is becoming increasingly important to consider all possible refrigerants available and to analyze overall system efficencies taking into consideration the prime mover, compressor, condenser, evaporator and refrigerant as well as the size and operating conditions of the plant. It was certainly interesting to note the possibilities of a material increase in capacity due to refrigerant change, even though — in this case — it may have been at a penalty due to the fact that the equipment had not originally been selected for the alternate refrigerant.—H. L. NACHMAN, Consulting Engineer.

GRANT V. WILSON —

"I Agree It's Wrong to Paint Canvas Joints"

SAM LEWIS has my continued admiration, after reading his page in the February HPAC. It takes a lot of courage and character for a professional man to publicize his mistakes as he has done in this article.

I was particularily attracted to his paragraph numbered 7, which deals with canvas joints in ducts. I agree with Mr. Lewis that the painting of such a flexible joint is one very positive step in the direction of defeating the purpose of the joint. I have seen some specifications that specify that the joint be painted with two coats of white lead and oil.

There is no doubt that flexible joints are necessary and an important part of good air distribution design.

The benefits from a broken or flexible joint can be had through the use of an asbestos woven fabric, which requires no painting, and will last almost indefinitely. Asbestos is a mineral, and is unaffected by moisture, most acids, and of course, is fireproof. This fabric is manufactured in what is known as "Underwriter's grade", and of course, the use of it is recommended in the National Board of Fire Underwriters' Pamphlet No. 90. The standard product is manufactured 6 in. wide, each edge being selvaged to prevent raveling or fraying.

To get the most satisfactory results, this asbestos fabric should be applied securely to the two metal surfaces, which are to be separated, in such a manner that the fabric itself will serve as a gasket or cushion between the metal surface and the strap or wire that holds it in place. If the fabric is first attached to a metal band, and then the metal band is fastened to the fan opening and duct work, it is apt to create a new source of noise. In this way, at least one side of it is bound to be on the upstream side.—GRANT V. WILSON, President, Grant Wilson, Inc.

WILLIAM T. SMITH —

"Not a Perfect Solution, But It's a Start"

CHARLES S. LEOPOLD — in his comments in the January HPAC — is correct in his statement that systems are usually operated at not over 76 F and 50 percent relative humidity whenever possible. However, the study reported upon in the article Is Comfort Air Conditioning Essential?, in the December HPAC, was based upon an 80 F dry bulb and 67 F wet bulb for the reason that this represents the upper limit for operating air conditioning systems. It could thus be assumed that when the wet bulb temperature reaches 67 F, the occupants will begin to feel some discomfort.

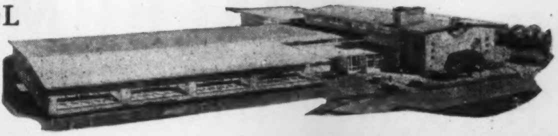
It seems evident that a formula or a method of analyzing the climate of various areas is desired. However, the criterion offered in this paper reported upon in the December article is not presented as a perfect solution. On the contrary, it is sincerely hoped that this paper will encourage others to delve into this problem.

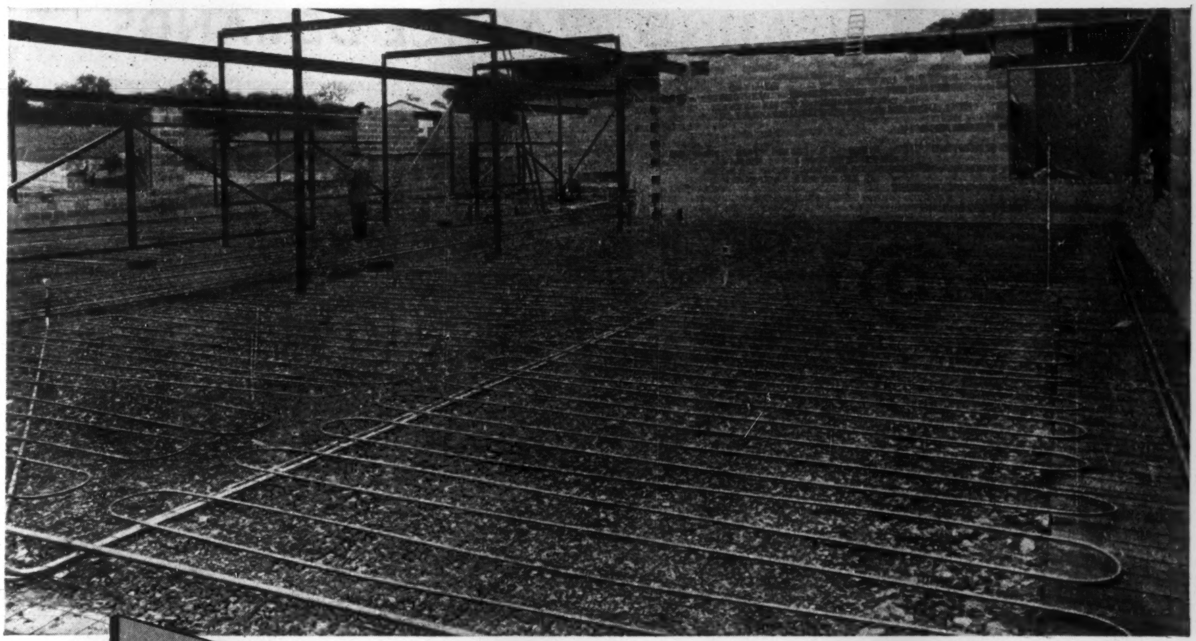
The probable error of the criterion based upon wet bulb temperatures appears to be relatively small and the method appears to be workable. It must be emphasized that any criterion must take into consideration the problems of collecting the data. Obviously, the Weather Bureau cannot be expected to make lengthy calculations every hour — which would be necessary were they required to publish average effective temperatures. On the other hand, it is quite simple for the Weather Bureau to indicate the number of hours the wet bulb or dry bulb equals or exceeds a given temperature.—WILLIAM T. SMITH, Head of Refrigeration Section, U.S. Air Force Hdq.

MANCHESTER ELEMENTARY SCHOOL

Manchester, Missouri

Architect: CHARLES W. LORENZ, Kirkwood, Mo.
Contractor: JUENGEL CONST. CO., St. Louis, Mo.
Radiant Heating: BAGLEY & COMPANY, Inc., Robertson, Mo.
Revere Distributor: GRINNELL COMPANY, Inc., St. Louis, Mo.



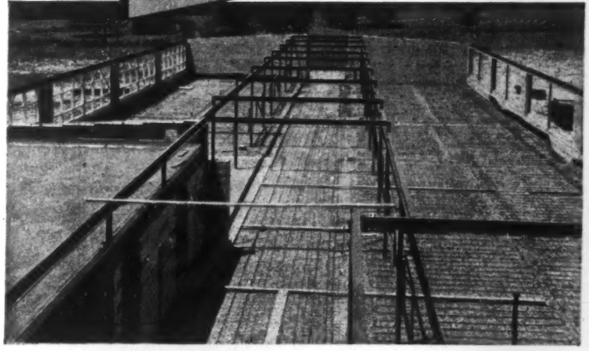


Another case of
COPPER
where it counts!

Radiant Panel Heating fits perfectly into the growing trend to 1-story school construction. It means warm floors, no drafts, and a healthier atmosphere for scholars. To the architect radiant panel heating means greater latitude in design, more usable space for the money. And for the user it means greater heating efficiency, lower redecorating costs and less cleaning and maintenance than when old-fashioned heating methods are used. The ideal material for panel heating is copper. For no other metal or alloy has all the desirable construction characteristics of this "ageless" metal.

To the contractor, the use of Revere Copper Water Tube means easy bending and handling . . . its long 60′ lengths require fewer fittings, the solder fittings used eliminate the need for welding, wrench work and thread cutting, while its lasting, non-rusting qualities have been proven through the centuries. Even being buried in a concrete slab doesn't bother enduring copper. Copper is the metal you can trust.

Keep out of trouble, protect your reputation for quality work . . . use Revere Copper Water Tube for air conditioning lines, radiant panel heating, hot and cold water lines, underground service lines, waste stack and vent lines, processing lines. See the Revere Distributor nearest you today. And, if you have a technical problem, he will put you in touch with Revere's Technical Advisory Service.



TWO VIEWS of the radiant Panel heating layout before concrete slab was poured. Floor area over 17,000 sq. ft. System was imbedded in slab 4". Gravel fill is 6" deep. Coils are 12" OC. System is divided into 4 zones, with all supply and return lines also of copper. Note edge insulation at right in large photo.

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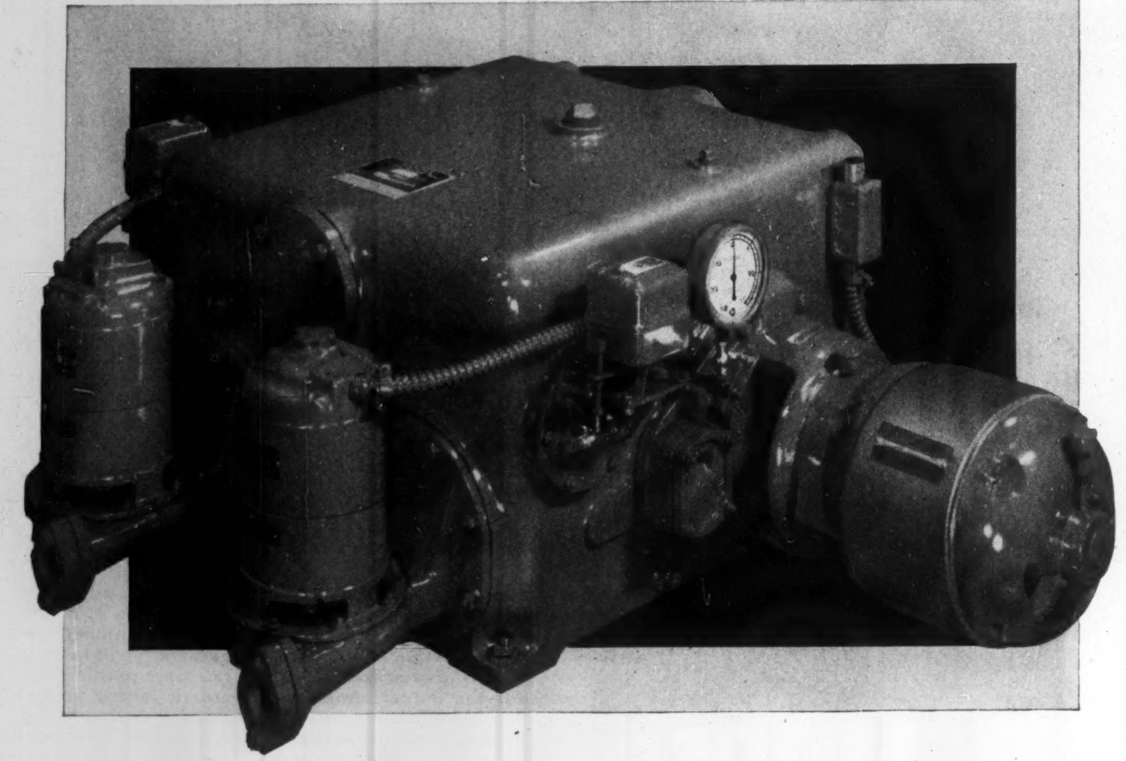
THIS NEW VACUUM HEATING PUMP

HAS THE INCREASED AIR CAPACITY EFFICIENT HEATING PRACTICE DEMANDS



It's the Nash (CSM)

Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- ✓ **Increased air capacity induces rapid system response without wasteful overheating.**
- ✓ **Separate air and water pumps individually selected to meet actual job requirements.**
- ✓ **Control system that operates individual pumps only when needed.**
- ✓ **Flexibility permitting addition of radiation without changing basic pump installation.**
- ✓ **Low, low, return line connection.**

NASH ENGINEERING COMPANY
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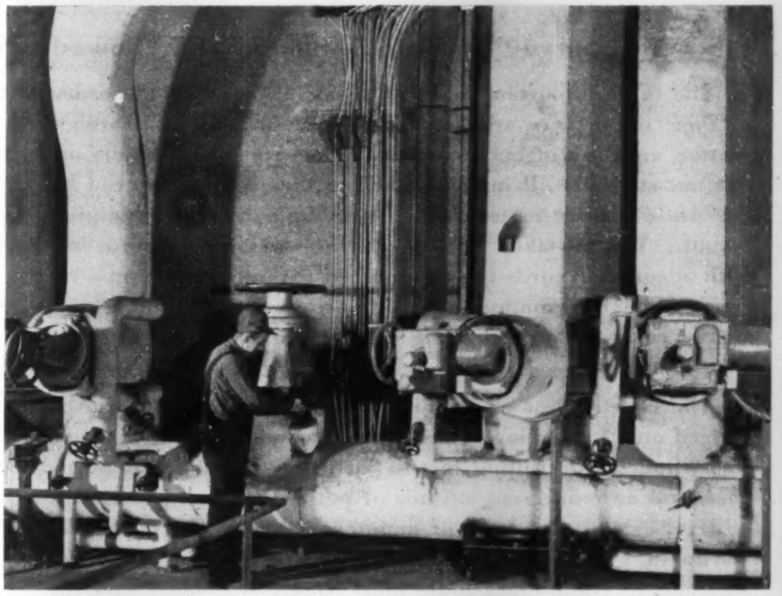

PIPING MAINTENANCE costs average from ½ to 2 percent of the sales dollar in most plants

Piping Maintenance Practices Surveyed

Survey of 117 industrial plants — reported at American Power Conference last month — shows wide neglect of piping maintenance . . . although piping represents a sizable part of the total cost of a plant. Here are suggestions for better maintenance

By Robert J. Pinske
Engineer, Crane Co.

THE RESULTS of a survey of 117 industrial plants are the basis of this paper. The survey was made by visiting various types of plants, interviewing plant executives, and maintenance and operating personnel associated with piping maintenance. The results are intended to appraise the level of maintenance in some plants and not to show how the average plant handles its maintenance because the number of plants considered is not representative of industry as a whole.

Piping Big Part of a Plant

Piping always represents a sizable part of the total cost of any plant. It may be 20 percent or more of the entire cost of the plant and may total from 10 percent to as high as two-thirds of the cost of the equipment. In most plants, the expenditures for piping maintenance will average from ½ to 2 percent of the sales dollar.

A piping system is usually complicated, consisting of a myriad of relatively small and isolated parts. The components are thought of as being stationary objects and subject to little wear. This misunderstanding is probably the main reason why piping maintenance is being neglected to a shameful degree in a great number of plants today. Yet these same plants will actually pay for their piping — over and over again — in unnecessary expenditures.

Efficient piping systems have an important influence on plant operating economy. Many plants recognize this fact and make every effort to properly plan, correctly install and adequately maintain their piping systems. There are other plants where poor layouts are in use and are detrimental to efficiency. Haphazard piping extensions which ultimately cause an overload condition may have been added over an extended period of time. In other instances, maintenance is either neglected or performed only when something has failed. Such situations will be reflected by high maintenance costs and reduced or irregular output.

Management is not often in a position to know the cost of waste taking place and its inefficiency because of inadequate records of labor, material and general piping practices. With this lack of any real objective, management is usually reluctant to invest in piping modifications.

The recommendations in this paper are flexible, since no hard and fast rulings can be given for individual circumstances of every plant. The intention is to point out the salient problems dealing with economic and efficient operation of a piping system.

The primary value of a review of an activity lies in what it may indicate concerning the future course of that activity. To be able to predict requires knowledge — and history is knowledge. If we want to know what is going to happen in the future in the field of piping maintenance, we can do no better than study the

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The American Power Conference, held last month in Chicago, is sponsored annually by the Illinois Institute of Technology together with several cooperating universities and local and national engineering societies.

What This Survey of Piping Maintenance Showed

1 The three important items of piping expense, in the order of their importance are, improper selection, dirt and foreign matter, and lack of maintenance. When repetitive repairs occur, an analysis will indicate whether they can be reduced by the use of better materials or by an improvement in piping layout. The mistaken or wrong action may not be seen, but with adequate records the resulting cost is outstanding on a report. The information needed to control costs, judge performance and plan efficiently can be provided only with the proper records.

2 The effectiveness of a piping maintenance program can be judged only in relation to the physical conditions and management policies prevailing in the particular plant. If management has an indifferent attitude or policy as to maintenance, it will get exactly that kind of maintenance from the piping department. A fact to remember is that the best ideas for improvements come from those most closely associated with the problem. Management should seek their advice constantly.

3 After a survey is made of all piping equipment, experience will indicate the level of maintenance required. This practical approach to the task of providing economical and efficient operation will show a consistent reduction in expenditures without the loss of quality of performance down to the level of practical minimum piping maintenance.

factors which have stimulated or retarded maintenance in the past.

Maintenance Neglected

Examination of the statistics reveal that 35 percent of the plants surveyed have various degrees of an organized piping maintenance policy. The remaining 65 percent have no maintenance policy, except to make repairs when necessary. It is in these latter plants where the need for great improvement exists. The following questions and results are a part of the original survey.

Survey Question No. 1 — What is the degree of responsibility in piping maintenance?

The type and size of the plant has a lot to do with who makes the initial examination and estimates the job. Fifty percent of the jobs are handled by piping supervisors and 50 percent by engineers. The most efficient plants are those where an engineer is assigned to do the estimating and properly lay out the work from a previously compiled set of standard specifications.

The importance of properly engineered jobs cannot be over-emphasized. A majority of the plants found a large percentage of their header piping for air, water, steam, oil, etc., too small for their requirements, even in their original installations. All piping should be recorded on drawings, with all piping modifications entered, before a job is started. The engineering department can then see the complete piping layout, taking into consideration standardized piping specifications, bypass connections where needed, proper type and spacing of hangers, expansion provisions, and the maximum use piping can be expected to provide for future expansion.

Survey Question No. 2 — Are accurate records for labor and material kept on all piping maintenance work?

Although 80 percent of the plants keep records of their machinery, motors, boilers, etc., 92 percent keep no piping records and do not know the cost of maintenance in a particular section of the plant, while 60 percent did not know the cost of maintenance for the entire plant. The 8 percent that do keep accurate records are at the two extremes in size. Forty percent stated their piping expenditures are loaded down with excessive charges.

Management officials of these plants estimate their maintenance costs are similar to plants of the same size. This may be true, insofar as having the same ratio of maintenance to production employees, but this is as far as any comparison can go. These plants have no idea what their maintenance should cost, and at what degree of efficiency they are operating. There is no formula that can predict what maintenance should cost.

There are many factors affecting the overall cost of maintenance that prevent comparison of one plant with that of another. The labor cost may vary. The efficiency and quality of maintenance and management's attitude toward it may be different. The number of shifts a plant is operating will also determine the amount of maintenance required.

The age of a piping system is frequently forgotten in determining how much maintenance is needed. The older the piping, the more maintenance required; this is a factor usually overlooked. In most plants, varying degrees of expansion have taken place, but piping has failed to be considered. As a result, the piping is subjected to more severe operating conditions of increased pressure, temperature, weight strains, rate of flow, shock and vibration.

There is no standard maintenance accounting in use. Some plants combine experimental and engineering costs in the maintenance expenditures. Other plants make no distinction in allocating cost of upkeep, repairs or replacement. In some plants, maintenance is not labeled as such and is charged to other accounts. Often, new construction and other non-maintenance work is charged to maintenance. The cost of maintenance is actually the operating cost of the piping department. The method in which these expenditures are applied determines whether the piping system is efficient and economically operated.

Survey Question No. 3 — Are records kept when traps, regulators, valves and particular sections of piping are installed?

It was found that 50 percent of the plants do keep a record, but only 25 percent are accurate enough for checking if a particular type or brand of piping is best suited for a job.

The other 50 percent do not keep any records at all. As a part of an equipment replacement program, piping components and their maintenance are seldom brought up in these reviews unless a major piping failure occurs. These results show there is a surprising amount of guess-work as far as maintenance cost of piping equipment — and its influence on replacement — in concerned.

Survey Question No. 4 — Are leaks of air, steam, water, oil, chemicals, etc., that are not a safety hazard repaired as soon as practical after they are found?

The statistics reveal that 74 percent of the plants find it more economical to repair leaks as soon as practical after they are reported. The 26 percent that have no definite program of repairing leaks will repair them in conspicuous locations because of the poor appearance they present. These are always a small percentage of the leaks.

The utilities immediately repair any steam or condensate leak, or a suspected defect in the piping, valves or traps that endangers their employees in any way or leads to uneconomical operation.

Some managements gave varied reasons why their piping systems cannot be as efficient as in a utility plant. The majority of these managements then stated that the cost of operating their piping department was increasing. To correct this rising cost, they lay off pipefitters, reduce working hours and eliminate all overtime. In the meantime, the leaks became larger and more numerous. The cost of the leakage rapidly increases and the piping equipment literally destroys itself. Obviously, this is false economy.

The more progressive firms use all periods of decreased production to repair the piping on straight-time rates, rather than neglect the maintenance to a later time when the piping material has to be replaced at premium pay rates.

Survey Question No. 5 — Are welded pipe, valves and fittings used?

According to the survey, there seems to be a general trend toward the more extensive use of welded piping equipment. Sixty-two percent of the plants are now using welded piping equipment on sizes 1 in. and larger for as many services as possible. Some plants are replacing defective valves, fittings and sections of piping, where practical, by cutting out defective sections and welding in new sections.

The greatest factor in welded installations is the elimination of leaks. An allowance for the additional cost of possible leakage must be included when estimating a piping installation. This factor is generally overlooked and management does not receive this information. Any additional cost to a job is added at a later date to another piping account.

The cost of maintenance must not be ignored in an effort to obtain a cheap installation. In some plants entire piping systems had to be replaced because of the high cost of keeping the connections tight and maintaining the system in dependable working condition.

Other advantages of welded connections include reduced cost of hangers and supports, less insulation cost, no damage to insulation from leaks, freedom from shutdown, strength of connections and neat appearance.

Survey Question No. 6 — Is maintenance overtime regularly scheduled?

Seventy percent of the plants do not regularly schedule overtime. The other 30 percent, including utilities, regularly schedule organized preventive piping maintenance on an overtime basis. These latter plants have proved to themselves that it is more economical to provide regular inspection and service of all components of the piping system.

Survey Question No. 7 — Is management given a progress report on piping maintenance?

Results show that 85 percent of the piping departments do not make written progress reports to management, and in most cases not even to their immediate superiors. Only 10 percent of the departments make a report to management. These reports include only the status of major piping projects and the reasons why overtime was worked. Five percent of the departments make out a monthly progress report to management that shows backlog of work, status of planned or routine work, status of major projects, percentage of work completed, overtime required because of routine and preventive maintenance, overtime caused by failure of equipment, estimate variances, and personnel status.

Top management in only 3 percent of the plants requests a report from the piping departments. There is a widespread failure of piping maintenance men to capitalize on the opportunities offered by progress reports. If a piping department is undermanned, there is no better way to prove this to management than by a report of the backlog of work.

Management must have reports to help set up budgets to guide a plant's operations. It is the piping supervisor's job to see that the budget becomes a tool to improve plant efficiency and not to reduce expenditures. The figures on the budget sheet are often the only report management receives. The time spent preparing a sound, realistic report will save time in explaining the variances that go hand in hand with poor budget planning. The budget must set up sufficient funds to provide the desired level of maintenance. Variations in work load caused by production increases or decreases, large repair jobs and similar projects must be provided for — so that maintenance can expand its services when the situation demands, or cut back logically when necessary. Many maintenance difficulties originate from a lack of understanding on management's part and inability to get the point across on the part of the piping supervisor.

Cost of Piping Maintenance

Properly Engineered Installation

The most positive and profitable approach to preventive maintenance is through proper design of the piping system. Operation of a system burdened with poor design characteristics always requires an increasing amount of maintenance. Unless that design is adaptable to change, maximum efficiency is a mirage and repairs must be made continuously.

A factor in the design and installation for rapid and efficient maintenance is the bypass valve. Installing a bypass connection around all meters, controls, regulators and traps is exceedingly important. Globe valves should be used in these installations because of their ability to be hand throttled without excessive wear of the seats and discs. The failure to provide bypass connections will cause unnecessary expenditures for overtime work and the possibility of shutting down a part of production.

In the design and installation of piping, drips and drains are frequently treated as an afterthought or entirely neglected. The failure to provide adequate drips and drains for a system is a serious and common oversight, as this omission will always require unnecessary expenditures.

For convenience, minimizing interruptions of service and general economy in maintenance, valves must be installed to permit individual sections of piping to be turned in or out when necessary. Union or flanged connections should be provided to permit easy removal of a section without causing a prolonged shutdown. With the rising cost of labor, management will want to reduce the amount of overtime required. This is a large factor in its reduction. Wherever practical, traps, strainers, reducing valves, etc., should be made up with standard connections to facilitate removal and replacement.

The application of welding to the design of piping systems has provided a means of eliminating many difficulties formerly encountered.

Installation for Ease of Maintenance

The limitation of maintenance facilities must be considered when selecting piping equipment. Many factors must influence the decision in making the choice of valves, fittings and pipe. Whether welded, flanged, screwed or other types of piping are considered, a factor to remember is that no single type of connection will meet all requirements. The final choice will usually be several types of connections for the general services. The skill and number of pipefitters must also be taken into consideration.

The piping selected for each requirement must reflect adequate study based on sound mechanical judgment. This judgment must include an awareness of all factors bearing on the installation. Regardless of age of the original installation, new equipment or replacements must be selected with care. To base the selection on existing piping is to neglect the fact that an improper selection may have been made in the past. The requirements of a piping system may be different from those in effect when an earlier selection was made. A piping system cannot be efficient and be operated with a minimum of expenditures unless the initial selection of piping equipment is correct. Some drastic misapplications of piping equipment were observed, especially in the smaller plants.

Piping systems are composed of approximately one-third material and two-thirds labor. In the past 10 years, the cost of labor has doubled while the cost of materials has increased by only 65 percent. The more rapidly increasing cost of labor must be the major consideration in purchasing piping equipment. The cost of installation of a poor quality product is the same as that of a quality product. The quality product will provide more economical service. Quality cannot be overemphasized, because in most piping systems the components are in locations that are difficult to service and maintain. These factors should be taken into consideration.

Annual Upkeep

The significant difference between the aims of upkeep and repair of piping is that upkeep tends to preserve the original efficiency, while repair replaces inoperative components. The upkeep of piping exerts a greater influence on output and economy than management realizes. Management has the idea that once the piping system is installed and in operation, it can be forgotten. More emphasis is placed on continuing maintenance of a production machine. The importance of upkeep will be realized if the vast amounts of pipe, valves, fittings and controlling devices in an average plant are analyzed and considered.

The most efficient and economical method of performing maintenance is by following an organized set of piping standards. Management, by approving the use of standards, will know what is necessary to keep the system efficient with minimum expenditures. The standards are not static, but must be amended as improvements are made. The necessity for each pipefitter or engineer to make his own initial mistakes and discoveries is eliminated by such standards.

From the pipefitter's point of view, the standards perform an important function, for they supply information that previously came from years of experience. A piping supervisor's job is changed from that of a technician to an inspector and a record keeper. An analysis of piping jobs will reveal the waste of man-hours where standards are not in use.

For example, two pipefitters are sent out to change a fitting in a small pipe line. They leave the shop to inspect the job, then return again for the necessary fitting. Returning to the job, 15 minutes is spent in performing the repair work. The time lost walking around making preparations for the job may amount to 1½ hr per man, or 3 man-hours.

The small plant controls this waste better than a large plant because of the difference in area. The large plants are noticeably lax in controlling wasted time. To help control this waste, portable work benches should be used, equipped with the necessary tools, vises, and assorted standard valves and fittings. The pipefitters can then be dispatched from job to job with the least amount of wasted time.

Cost comparisons are frequently made between two plants, one practicing "breakdown maintenance" and the other preventive maintenance. The plant using breakdown maintenance will occasionally show a lower operating cost.

This type of comparison is misleading. To make repairs only when a breakdown occurs may result in lower expenditures over a short period of years. However, major overhaul at greater expense will eventually be required. Such major expenditures will result in greater maintenance cost per year than for preventive maintenance, where annual cost is on a lower and more uniform basis.

One of the functions of the piping supervisor is to advise management on the most economical and efficient maintenance program. It is his duty to sell management on the soundness and benefits of preventive maintenance. Efforts to use preventive maintenance by selling the pipefitters first and management last encourages failure.

The advantages of a policy of preventive maintenance include reduction of maintenance costs and overtime, increased service life of equipment, less time lost due to unnecessary breakdowns, and the assurance that overall efficiency is maintained at a high level.

Cost of Neglect

There are plants where no attempt is made to separate the cost of piping services from other items entering into production. It is in these plants that high energy costs are found to exist, because identity of their magnitude is lost in unsegregated general costs.

Many plants have metering equipment and an accounting routine for evaluating the proportion of manufacturing cost due to the piping services used. The only way to know where the air, steam or water are going is to install meters in the lines before they enter a department. Then it is possible to know the amount of services required, consumed or wasted, and the advisability of having auxiliary means of providing services for weekends and periods of plant shutdown. The initial cost of meters and installation is small when compared to the savings that will be revealed.

The remedy for leakage is (1) a realistic approach to the significance of leaks; (2) frequent inspections; and (3) conscientious follow-up of all reported leaks. Having the inspections made and reported in writing by some one other than the pipefitter is desirable. The report should be made on a special form and submitted direct to the plant engineer. When the work is completed, the form is approved and returned. Unless accomplished in this manner, experience has shown that wastage cannot be consistently eliminated.

When steam leaks are repaired as soon as practical, there will always be a decrease in fuel consumption. In some cases this will allow a reduction of time for fuel handlers,

TABLE 1—COST OF WATER LEAKS of various sizes at pressure of 30 lb per sq in.

Size of opening, in.	Gal per hr	Cost. dollars per hr	Gal per month	Cost, dollars per month
1/64	1.45	$ 0.0002	1,045.22	$ 0.13
1/32	5.88	0.0007	4,235.98	0.51
1/16	23.46	0.003	16,889.04	2.03
1/8	93.75	0.011	67,501.08	8.12
3/16	210.96	0.025	151,891.13	18.27
1/4	375.08	0.045	270,059.26	32.49
5/16	586.04	0.071	421,950.46	50.76
3/8	843.92	0.102	607,619.59	73.10
1/2	1,500.25	0.180	1,080,182.09	129.95
5/8	2,344.17	0.282	1,687,801.75	203.04
3/4	3,375.59	0.406	2,430,728.42	292.38
1	6,001.01	0.722	4,320,728.42	519.78
1 1/2	13,501.89	1.62	9,721,363.82	1,169.48
2	24,004.05	2.88	17,282,913.62	2,079.13
3	54,009.11	6.50	38,886,555.60	4,678.05

Based on the cost of water at $0.90 per 1000 cu ft and an orifice coefficient of 0.61.

TABLE 2—COST OF AIR LEAKS of various sizes at pressure of 100 lb per sq in.

Size of opening, in.	Cu ft per hr	Cost, dollars per hr	Cu ft per month	Cost, dollars per month
1/64	15.56	$ 0.001	11,203.92	$ 1.01
1/32	62.79	0.006	45,208.80	4.07
1/16	251.55	0.023	181,116.00	16.30
1/8	1,006.20	0.091	724,464.00	65.20
3/16	2,261.26	0.204	1,628,106.48	146.53
1/4	4,017.00	0.362	2,892,240.00	260.30
5/16	6,281.73	0.565	4,522,845.60	407.06
3/8	9,048.00	0.814	6,514,560.00	586.31
1/2	16,107.00	1.45	11,597,040.00	1,043.73
5/8	25,155.00	2.26	18,111,600.00	1,630.04
3/4	36,270.00	3.26	26,114,400.00	2,350.30
1	64,350.00	5.79	46,332,000.00	4,169.88
1 1/2	144,729.49	13.03	104,202,352.80	9,378.21
2	257,297.04	23.16	185,253,868.80	16,672.85
3	578,918.34	52.10	416,821,204.80	37,513.91

Based on the cost of air at $0.09 per 1000 cu ft and an orifice coefficient of 0.65.

TABLE 3—COST OF STEAM LEAKS of various sizes at pressure of 150 lb per sq in.

Size of opening, in.	Lb per hr	Cost, dollars per hr	Lb per month	Cost, dollars per month
1/64	1.61	$ 0.002	1,158.71	$ 1.14
1/32	6.52	0.006	4,695.81	4.60
1/16	26.00	0.025	18,722.27	18.35
1/8	103.93	0.102	74,828.07	73.33
3/16	333.86	0.327	240,378.41	235.57
1/4	415.80	0.407	299,373.28	293.39
5/16	649.66	0.637	467,751.70	458.40
3/8	935.52	0.917	673,574.64	660.10
1/2	1,663.10	1.63	1,197,432.15	1,173.48
5/8	2,598.62	2.55	1,871,006.79	1,833.59
3/4	3,742.00	3.67	2,694,237.58	2,640.35
1	6,652.40	6.52	4,789,728.60	4,693.93
1 1/2	14,967.48	14.67	10,776,584.43	10,561.05
2	26,609.60	26.08	19,158,914.40	18,775.74
3	59,871.61	58.67	43,107,557.40	42,245.41

Based on the cost of steam at $0.98 per 1000 lb and a moisture content of 2 percent.

Tables 1, 2 and 3 are from Flow of Fluids Through Valves, Fittings and Pipe, Crane Co. Technical Paper No. 409, 1942, pp. 54, 86 and 34, respectively.

> "Efficient piping systems have an important influence on plant operating economy. Many plants recognize this fact and make every effort to properly plan, correctly install and adequately maintain their piping systems."

fuel handling equipment, the need for operating as many boilers or the installation of a new boiler.

Most steam piping is installed in inaccessible places. If periodic inspections are not made, leaks go undetected until the extent of the damage is so great that the equipment has literally destroyed itself. It cannot be over-emphasized that once a steam leak occurs in check valves, screwed or flanged connections, or through valves that do not seat properly, the leak must be repaired immediately. If leaks are neglected, their cost will increase rapidly and components will have to be replaced at a greater cost instead of being repaired. All steam leaks are conducive to corrosion.

There are many examples showing that leakage of steam is costly, but damage to equipment caused by the leakage of steam is even greater. When steam operated equipment is shut down, severe and extensive damage is caused by steam leaking into the equipment, through faulty valves, check valves and traps. It is poor economy to neglect even the smallest steam leak in any location.

Measuring Piping Maintenance

Management is faced with the difficult problem of performing maintenance at a level where it will be most economical to operate. Most piping departments are being operated on a cost formula because management is failing to examine how much maintenance is required. Important indirect costs and operating efficiency are being neglected. The following principles can be applied to satisfy the needs of a particular plant.

1 The job of improving the maintenance of a piping system will vary from plant to plant. In plants that have been in operation for a number of years, it is a difficult task to set up an organization that will increase operating efficiency and decrease the piping expenditures. Management must first make a complete inventory of all the physical assets, including drawings.

2 The next objective is to list the requirements that are necessary to maintain the piping assets in efficient working order. Piping systems require inspection, replacement, adjustment, cleaning, repairing and overhauling of the various components such as traps, regulators, packing boxes of valves, expansion joints, etc. An analysis of this type is difficult to make and must be thorough. It can be compared to the setting up of a schedule of preventive maintenance in a new plant to assure the most economic and efficient operating condition. In an old plant, it is necessary to add the work needed to restore the piping system, taking the factor of repairs as well as upkeep into consideration.

3 The size of the piping force is based upon the amount of maintenance required. One method successfully used is to convert each item of the work load into man-hours. Each piping job must be analyzed and then standards developed for the various jobs. Many production departments have successfully used this method for many years but it is seldom applied to maintenance.

Theoretical knowledge is not adequate to organize a workable method because of the intricacies of maintenance. Piping maintenance cannot be organized on a mass production basis. Management must use the practical knowledge of the piping supervisors to determine the required maintenance and to help estimate the man-hours and skills needed for each job. Historical data will be helpful but should not be relied upon to give a true picture of conditions. There are managements who tend to operate at a low level of efficiency because of lack of foresight, records and the reluctance to invest additional capital. A thorough analysis will reveal for them how many pipefitters are required and how much of the work load should be subcontracted to an outside piping contractor. This is an economical practice in some plants.

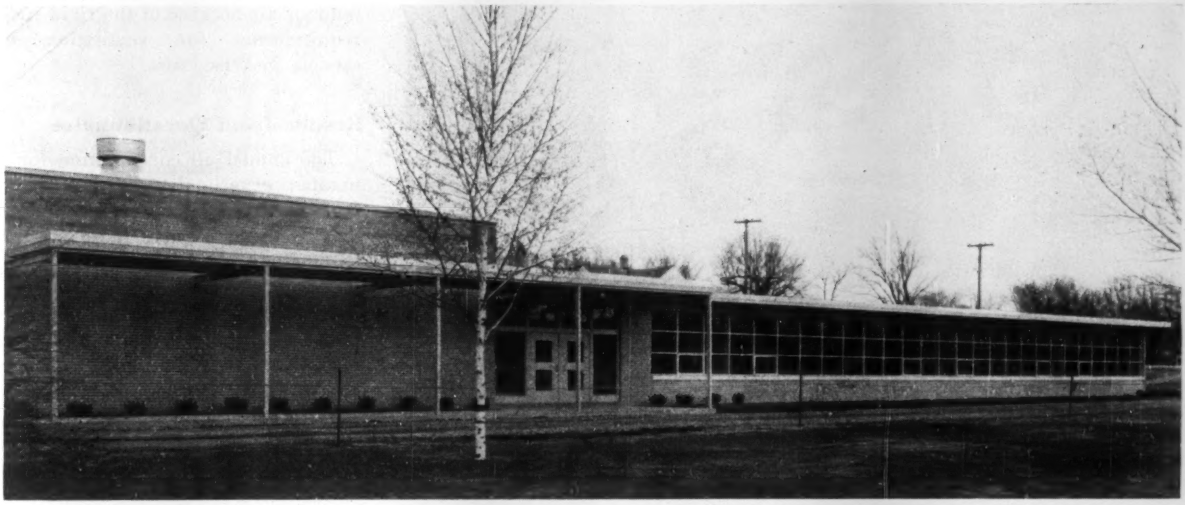
4 The efficiency of a piping department is judged by the time it takes the men to do the various jobs. The cost of maintenance will decrease if a pipefitter is shown an easier method to perform a job, given new or more adequate tools, and if the time lost looking for material can be eliminated. Good morale, as initiated by management's attitude towards the pipefitting department, is a large factor. A way to measure the efficiency of the pipefitters is to check their performance against the job estimate — provided the piping supervisor made such an estimate.

5 The quality of piping maintenance will be disclosed by physical inspection for defects and performance tests. The piping supervisors make up the first line of inspectors. They are responsible for observing that each piping job is up to a predetermined standard. While the pipefitters are working on a job, good supervisory inspection is the best way to assure high quality work.

Some of the larger plants have a permanent inspection corps reporting directly to the administrative branch of management. This corps is responsible for all preventive maintenance inspections, as well as job conditions and quality of performance inspections.

The reasons for repair of the equipment should be reported periodically to management, giving a code breakdown of the reasons for every significant repair. For example, a category on trap maintenance might indicate a need for higher quality equipment or more frequent preventive maintenance; a code item such as operator abuse of air valves and hoses would place the fault on production; and the location of frequent repairs will indicate areas of poor maintenance. If adequate records are kept, an analysis of repetitive repairs will reveal any poor quality piping material, improper selection or improper job planning and scheduling.

6 How much piping maintenance is necessary is a difficult question. Management is interested in knowing whether it is under-maintaining, over-maintaining, or doing just the right amount. The piping supervisors should know the size of the job and the number of pipefitters required to do it. They will also know through practical experience if the maintenance goal is set too high or too low.



1 TYPICAL SCHOOL building with four classrooms and a multi-purpose room is used in this article in comparing heating costs

Use Light or Heavy Oil?

Should No. 2 or No. 5 fuel oil be used for heating a school? What data is available that will help to choose?

By Robert I. Anderson
Mechanical Engineer
West and Anderson, Architects-Engineers
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• The cost of a No. 5 oil burner and tank will total about 50 percent more than a No. 2 oil burner and tank, says the author. This additional cost represents a 3 percent increase in the heating contract and less than a 1 percent increase in the total cost of a typical new school. The fuel costs will be reduced by about 20 percent with the No. 5 oil burner installation. The additional cost of the No. 5 oil burner and tank will be paid for in 2¾ years of operation. His figures are based on several school jobs designed by his office.

Does it really pay to install a heavy oil burner and large oil storage tank in our school? How much in addition to our base bid will it cost to put in a heavy oil installation? How long will it take to pay off this increased cost and realize a saving in our annual fuel bill? These are questions thrown at consulting engineers by a school board in the process of designing a new school building or when an old building is to be remodelled.

How are such questions answered? An attempt will be made in this article to present some facts to aid others who are groping for some sort of measuring stick in analyzing similar heating problems. The scope of this article is limited to the analysis with oil burners with a maximum capacity of 35 gal per hr in school buildings — similar to the one shown in Fig. 1.

The prime factors involved and treated in this article are the following:

a) Number of gallons of oil consumed per year.

b) Cost of oil per gallon. (No. 2 oil — sometimes referred to as No. 3 oil — No. 5 oil and No. 6 oil)

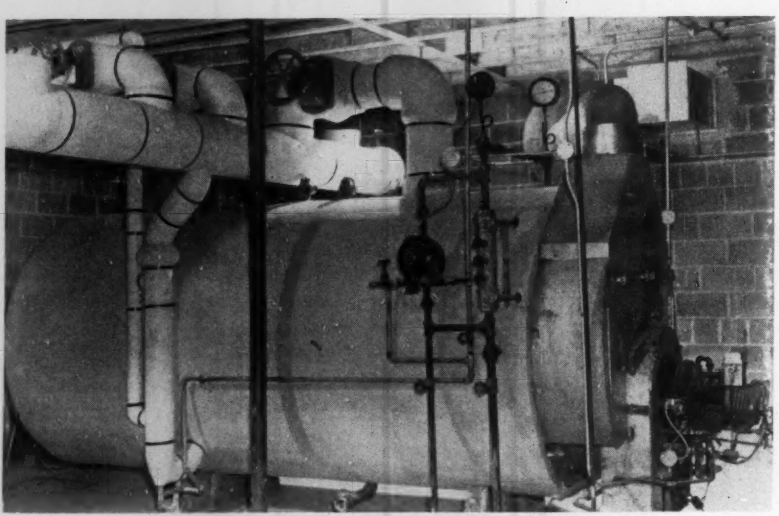
c) Future expansion of school buildings and resulting increase in oil consumption per year.

d) Limitation of money allowed for the heating installation.

e) Types of roads accessible for oil delivery.

When considering the different types of oil burner installations, the most widely used are listed below:

a) No. 2 oil burner, 1000-5000 gal tanks, with oil costing about 14.5c per gal.



2 **THIS BOILER, equipped with a No. 5 oil burner, is used in one school. An 8000 gal tank is also part of the installation**

b) No. 2 oil burner, an 8000 gal tank, with oil costing about 11.5c per gal.

c) No. 5 oil burner, an 8000 gal tank, with oil costing approximately 9.5c per gal.

d) No. 6 oil burner with preheating devices, an 8000 gal tank, with oil costing approximately 8.5c per gal.

The No. 2 oil burner with 1000 to 5000 gal tanks does not qualify for wholesale purchasing of oil in the Milwaukee area. However, with an 8000 gal tank, the purchase of oil is wholesale. The maximum capacity on Class A Wisconsin highways is 4800 gal of heavy oil. Therefore, with a delivery of this amount, an 8000 gal tank allows a reserve of 3200 gal. The No. 5 oil is a heavy oil which does not require preheating devices.

Comparison Made with Example

The best way to present the case of heavy oil vs. light oil would be by an example. A typical school building would be one with four classrooms and a multi-purpose room such as the one shown in Fig. 1. The design heat loss of this school building is 800,000 Btu per hr with an outdoor design temperature of −15 F. The annual fuel oil consumption for the building is about 10,000 gal of No. 2 oil, according to the results of a questionnaire sent to the schools in the Milwaukee area. It is interesting to compare the actual consumption to the calculated total using the degree-day method:

$$F = U \times N \times D \times C_t$$

where F = annual fuel consumption in gallons; U = 0.00383 unit fuel consumption for oil; N = 800 thousand Btu per hr — design heat loss; D = 7097 degree days for locality; and C_t = 0.800 temperature correction factor.

$$F = 0.00383 \times 800 \times 7079 \times 0.800$$
$$F = 17{,}300 \text{ gal}$$

It is believed that the differences stem from the fact that the unit ventilators are operating only when the school is occupied. When the school is not in use, there is no outdoor air introduced into the building. The factor N in the equation assumes that the heat loss of 800,000 Btu per hr is based on a 24 hr day and a 7 day week condition. Of this total heat loss, approximately 60 percent can be attributed to the heating of outdoor air because of the rigid code requirements for ventilation of schools in Wisconsin.

TABLE 1—COST COMPARISON **for fuel oil and other related factors for three types of installations in a school**

Type of installation	Price per gal of fuel oil	Heating value of oil, Btu per gal	Annual oil consumption, gal	Annual cost of fuel oil	Original cost of burner and tank	Total heating contract	Total cost of building ($10 per sq ft)
No. 2 oil burner, 3000 gal tank ..	14.5c	142,000	10,000	$1450	$1000	$16,000	$90,000
No. 2 oil burner, 8000 gal tank ..	11.5c	142,000	10,000	$1150	$1300	$16,300	$90,300
No. 5 oil burner, 8000 gal tank ..	9.5c	148,000	9,600	$ 910	$2000	$17,000	$91,000

Results from Questionnaire

The annual oil consumption for a number of schools was determined from the results of a questionnaire sent to them. Where there was no automatic night temperature control, the consumption was higher. Evening use of the school building also affected the oil consumption. Oil prices were those currently in use in the Milwaukee area.

To proceed with the example, the summary given in Table 1 provides some of the data collected from the survey in three of the classifications described previously.

The heating and ventilating contract for the school referred to in Table 1 would average around $16,000 complete, including the oil burner and tank. Of this amount the cost of the burner and tank, utilizing No. 2 oil and an 8000 gal oil tank, would be approximately $1300 — depending upon the type of automatic controls installed. For a No. 5 oil burner and an 8000 gal tank, the cost would be $2000, or an additional $700 — again using an average installation of automatic controls.

Fuel Costs Analyzed

Keeping these figures in mind, we shall analyze the fuel bill of this school in the Milwaukee area. It has been found that the average oil consumption per year for such a school with four classrooms and a multi-purpose room is about 10,000 gal. At 14.5c per gal, the retail, price, the school board pays $1450 per year. If an 8000 gal tank is installed, the school could purchase oil wholesale at around 11.5c per gal resulting in an annual cost of $1150. At 9.5c per gal, the price for No. 5 oil, the school board pays only $910 per year.

Considering the additional cost for a No. 5 oil burner installation of $700, the board will save $240 per year — the difference between $1150 and $910. Therefore, in 2¾ years the saving will pay for the additional cost of the installation. This amortization value may be clarified by the following details — referring to Table 1:

Comparison between No. 2 oil and No.

5 oil burners — both with 8000 gal tanks is given below:

a) Additional cost for No. 5 oil .... $2000 − $1300 = $700, or 53 percent greater.

b) Saving in annual fuel costs .... $1150 − $910 = $240, (21 percent lower.)

c) Years for amortization .... 700/240 = 2¾ yrs.

d) Additional cost/heating contract .... 700/16,000 = 4.4 percent.

e) Additional cost/total cost of building .... 700/90,300 = ¾ of 1 percent.

From the figures, it can be readily seen that the school board can cut the annual fuel cost 21 percent by simply increasing the total building cost less than 1 percent.

The life of a burner must also be considered. In our experience, we have found that, on the average, the No. 2 oil burner has to be replaced after 10 years. However, the No. 5 oil burner may last 20 years.

Contractor Makes Proposition

Naturally, the larger the school, the greater the annual fuel consumption. As a result, the savings in large schools are more prominent. One contractor in Milwaukee offers a unique proposition to prospective clients. For schools, or for other buildings which will use a minimum of 10,000 gal of oil a year, he will "finance" the additional cost of the heavy oil installation at no extra cost to the owner. Then, when the equipment is "paid for", the owner thereafter automatically realizes the saving in fuel cost. In case the owner is either skeptical of, or prejudiced against the use of No. 5 oil, this contractor gives him the following proposition:

"Mr. Owner, let me install the No. 5 oil burner for the same cost as the No. 2 oil installation. Then, I will charge you the price of No. 2 oil for a period of two or three years, depending on how much oil is used. Actually, I shall be supplying you with No. 5 oil all the time and I shall apply the price difference of the oil to the cost of installation and make up the difference in this manner. When I turn over the installation to you, I shall then begin charging you the lower price of the No. 5 oil."

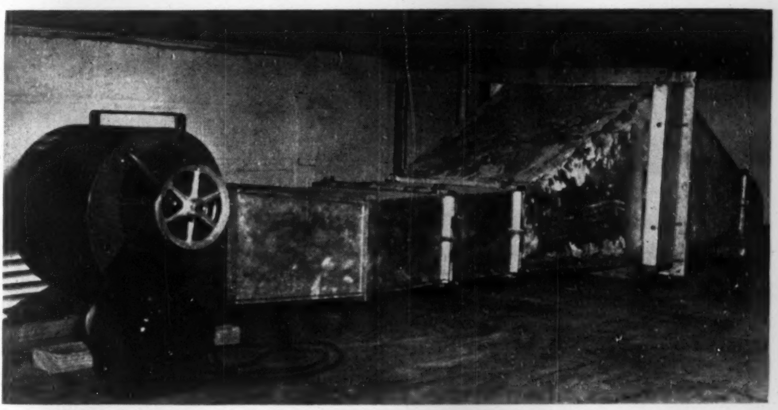
There are, of course, factors that influence a school board to reject a heavy oil installation. The roads that are accessible to the school must be able to take the heavy load of a 5000 gal truck. If the school is very small, the amortization rate of a heavy oil installation would probably be too slow. For example, heavy oil burners would not be practical for a home. An absolute limit of the funds may make the additional cost prohibitive. And then, if the school is in a very remote area, heavy oil supply may be out of the question. Another factor that should be considered is the additional attention in the way of operation and maintenance that the heavy oil installation may require.

As with all heating problems in installations of any size, the right answer depends on engineering and economics. Therefore, an analysis of the particular problem by a qualified engineer is the best procedure.

Variations in the cost of installations are quite wide when considering all the various methods of automatic temperature control. This holds true in all phases of temperature control. Also, one has to consider the possibilities of future expansion in making an evaluation. An increasingly greater annual oil consumption will of course speed up the amortization of the heavy oil installation.

[The author wishes to acknowledge and thank Schellenberger & Gregg, Architects-Engineers, Milwaukee, for assistance in preparing this article.]

Delivers Sterile Air to Laboratory Room



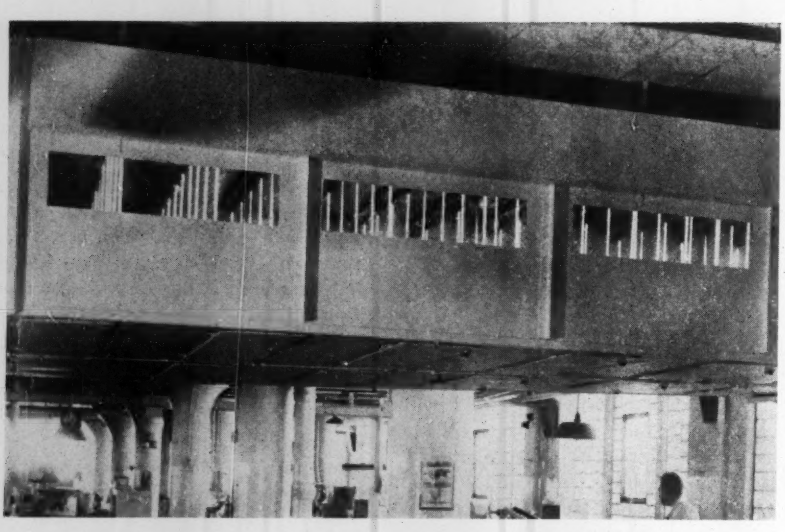
THE FILTER system is mounted between two ceilings less than 3 ft apart, delivers 100 cfm of sterile air into the sterile room below

An air conditioning problem in a sterile room used by Princeton Laboratories, Inc., Princeton, N. J., for the preparation of hormones and enzymes has been solved by installation of a dry filter system, according to the Mine Safety Appliances Co. The installation was made by C. Page.

Installation was comparatively simple. The equipment consists of a sheet metal duct into which four removable filters are clamped and sealed, and a standard blower driven by a ¼ hp motor. It is mounted on the top of the sterile room in line with an opening through the ceiling below. The first three of the four filters are 10 × 20 × 1 in. glass fiber prefilters to remove the largest particles from the air. The fourth is a filter 24 × 24 × 5⅞ in. overall, consisting of 150 sq ft of filter paper over corrugated paper spacers, to remove the finest particles.

The filter unit specified has an initial pressure drop of 0.2 in. of water at the maximum (100 cfm) flow rate used in this system. It is expected to give at least a year's service before replacement.

The filter system delivers 50 to 100 cfm of sterile air. This adds to the comfort of those in the room and permits working there continuously instead of short periods during which no air could be safely added to the 850 cu ft of air sterilized by ultra violet light. Air is exhausted from the room through the compressor compartment of a freezer unit which is provided with a sealed air duct through the wall. Air flow through this unit removes the heat generated by the compressor.



Disinfecting Air with Sterilizing Lamps

Air velocities, humidities, lamp location, other factors govern "percentage of kill"

By R. Nagy, G. Mouromseff and F. H. Rixton
Westinghouse Electric Corp.

WITH THE DEVELOPMENT of high intensity ultraviolet emitting sources, one of the easiest methods of reducing the bacteria and virus content of the air passing through air conditioning ducts is by the use of ultraviolet radiations installed in the ducts. Large volumes of air can be disinfected by a small number of lamps requiring simple installation.

Pioneer Studies Cited

The pioneer studies on the use of ultraviolet radiations in air ducts were reported by Wells and Wells.[1] (All references are listed at end of article.) They exposed atomized E. coli to the radiation from a quartz mercury vapor lamp and observed the percent of organisms destroyed at different distances from the lamp and at different air velocities. Their results indicated that the ultraviolet radiations were more effective at higher air velocities. However, they concluded that this was the result of variation in humidity and that the ultraviolet lamps were 10 times as efficient at low humidities as at high humidities. This paper stimulated considerable interest in disinfecting air by ultraviolet radiations and in the development of efficient and inexpensive ultraviolet sources.

Whisler[2] repeated the work of Wells using a small diameter duct and a Wells centrifuge to collect the samples. However, he also concluded that the variation in susceptibility of the organism at different air velocities was the result of variation in humidity. Unfortunately, the output of the lamp was not measured at different air velocities nor was the quantity of energy necessary to destroy the bacteria determined in any of these tests.

The first tests reported by Rentschler and Nagy[3] were made by spraying E. coli in an actual air conditioning system operating with a flow rate of 5800 cfm by determining the number of surviving organisms with the lamp both on and off. The system was operated at only one air velocity of 414 fpm, but different intensities of radiation and humidity were applied. However, they did not observe any change in the rate of organism destruction as a result of humidity change. They found that the arrangement of the lamps in the duct was important in order to obtain full utilization of all of the ultraviolet energy emitted.

In a second paper, Rentschler and Nagy[4] reported the use of an apparatus similar to that of Whisler. However, much higher air velocities were used and it was proved that the organisms were more readily destroyed with higher air velocities. They attributed this anomaly to the differential selectivity of the Wells air-centrifuge. They also showed that E. coli suspended in air at various humidities and intensities of radiation required the same amount of energy as organisms from the same spray culture settled on Petri plates.

Luckiesh and Holladay[5] made all of their fundamental observations with a 24 in. diameter duct in which the lamp was located in the center and parallel to the air flow. In these studies the air velocity was varied from 25 to 195 fpm. Their results showed that it required from 4.68 to 10.25 milliwatt-minutes per sq ft to destroy 63.2 percent of the organisms in a non-reflecting duct. In an aluminum painted duct the values ranged from 3.66 to 8.97 milliwatt-minutes per sq ft for a 63.2 percent kill. However, in their calculations to determine the amount of energy for various size ducts, they used a value of 4.75 milliwatt-minutes per sq ft for their value of "E" (63.2 percent kill). Since their data definitely shows that the reciprocity law (time of exposure times intensity equals a constant) does not hold when the velocity of air was varied. a value of "E" cannot be arbitrarily chosen which would be applicable to all survival values. Their data on the effect of baffles on the survival ratio at different velocities also indicated that it appeared as if the organisms were more readily destroyed at the higher velocities as was reported by Rentschler and Nagy. The question of the effect of humidity was further confused in that Luckiesh and Holladay's curves indicate that it would be extremely difficult to destroy E. coli under conditions of high humidity. However, Rentschler and Nagy have shown that even the most resistant E. coli can readily be destroyed at high humidity. In view of the limited and conflicting data on the use of ultraviolet radiations in air ducts, it was thought that further studies with actual installations should be conducted.

Since 1941, considerable data have been collected in the authors' laboratories on the bactericidal efficiency of ultraviolet lamps placed in air conditioning ducts. Many experiments were conducted using different combinations of duct diameters, lamp arrangements and types of lamps, air velocities and humidities, energy inputs, kinds and types of bacteria, and various methods of collecting bacteria samples. Parallel to the bacteriological studies, considerable effort was devoted to the development of an efficient ultraviolet source which would be especially suitable for air ducts. In this article the results of some of the most significant bacteriological experiments will be analyzed and reported with particular attention to the most efficient utilization of a high intensity sterilization lamp in air ducts.

What the Tests Show

1 Wells and Wells[1], Whisler[2], and Luckiesh and Holladay[5] (all references are listed at end of article), have stated that the amount of energy needed to destroy airborne organisms at low humidity is about one-fifth to one-tenth that required for similar organisms on Petri plates or in distilled water. No reason for this anomaly has been proposed. The moisture in the air has no appreciable absorption for bactericidal radiations and therefore, water, per se, could not account for their results.

2 Rentschler and Nagy[4] have shown that airborne organisms in still air required the same amount of energy as similar organisms on Petri plates regardless of the relative humidity. As the velocity of air was increased above 200 fpm, the amount of energy necessary to destroy 50 percent of the organisms was decreased by a factor of more than five. [A Petri plate is a small dish used for bacteria cultures.]

3 The present tests also show that in large ducts, as the velocity of air is increased, the energy for high survival values appears to decrease. Since the Reynolds number, which is a measure of turbulence, increases with increase in air velocity, it must be concluded that in turbulent air organisms receive a greater amount of bactericidal energy than would be expected from calculation with linear flow. Table 2 shows that at high air velocities and resulting turbulent air flow, the amount of energy for high survival values is much lower than comparable survival values on Petri plates. However, at lower survival values the amount of energy approaches that required to destroy these organisms on Petri plates. This would indicate that the range of droplet sizes is an important factor.

4 The smallest droplets would follow the flow of the turbulent air and receive much more irradiation than droplets in linear flow, thus accounting for the apparent smaller amount of energy at high survival values. The larger droplets, because of their greater mass, would not be deflected as readily by the turbulent air and would be exposed to only that amount of energy expected from linear flow. Under high humidity conditions the droplets are relatively large and as a result the turbulent air would not have much effect on their linear flow. Consequently, at high humidities and high survival the amount of energy needed to destroy air-borne organisms is of the same order of magnitude as organisms on Petri plates.

5 A careful perusal of the results of the various investigations shows that all the experimental data are very similar. That is, the data show that there is increased ultraviolet efficiency with increased air velocities, and the energy at low survival values is still of the same order of magnitude as for similar organisms on Petri plates. Therefore, it is necessary that all calculations of the amount of ultraviolet energy needed in an air duct be based on the survival value desired in the system rather than on a survival value of "E" (63.2 percent). High intensity lamps which are especially designed for air ducts can readily supply the necessary ultraviolet energy to obtain the low survival values required in most installations.

Development of the Lamp

Most ultraviolet sources operate at their highest efficiency under room temperature conditions. The output of such a lamp will diminish as the temperature increases or decreases from this optimum region; for example, the output at 40 F is about two-thirds of the output at 80 F. Air currents passing over the lamp cause a similar decrease in output by cooling the lamp to a temperature below its normal operating temperature.

The development of an inexpensive high intensity ultraviolet lamp which would give optimum output in air conditioning work was achieved after much experimentation. This lamp, designated as "A", makes possible a higher intensity under all air duct conditions. The lamp may be mounted on readily available flourescent lamp ballasts and has the advantage of being heavily loaded, which permits it to retain high output under low temperature or high velocity conditions. The lamp may be operated at 120, 200, 300 and 420 milliamperes depending upon the transformer selected. Approximately 95 percent of the radiation emitted from the lamp is at 2537 Angstrom units (AU) which is in the region of the spectrum that has the greatest germicidal effectiveness. The characteristics of this lamp as measured at an ambient temperature of 80 F in still air are shown in Table 1.

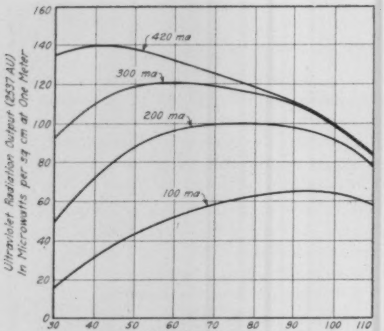
The ability of the lamp to operate at high rates of milliamperes results in high ultraviolet output which in turn reduces the number of lamps needed in an installation for a given ultraviolet concentration requirement.

Operating Current Varied

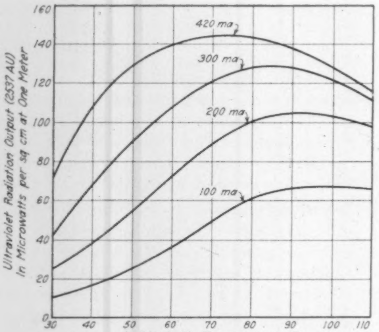
Fig. 1 shows the effect of operating current on the ultraviolet output of lamp "A" at ambient temperatures from 30 to 110 F under still air conditions. High lamp loading causes

TABLE 1—CHARACTERISTICS of the sterilization lamp "A" in still air at 80 F at different operating currents

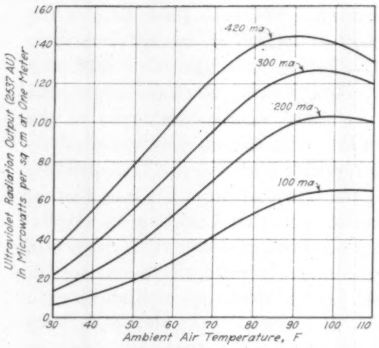
Operating current (amperes)	0.120	0.200	0.300	0.420
Open circuit voltage	600	600	600	450
Operating voltage	180	150	130	115
Watts	17	25	32	39
Ultraviolet intensity (microwatts per sq cm at one meter)	70	100	115	120
Ultraviolet output (2537AU) in watts	8	11.4	13.1	13.8
Rated life in hr at 12 hr per start	6000	6000	6000	6000



1 FOR STILL AIR the ultraviolet radiation output of lamp "A" varies as the ambient air temperature is varied from 30 to 110 F as shown here



2 FOR 100 FPM air velocity perpendicular to the lamps the radiation output increases as the ambient air temperature is increased and then drops



3 FOR 450 FPM air velocity perpendicular to the lamps the radiation output increases as the ambient air temperature is increased

the greater outputs to occur at lower ambient air temperatures as the lamp current is increased, the optimum output being at 95 F for 100 milliampere operation, at 75 F for 200 milliampere operation, at 60 F for 300 milliampere operation and at 40 F for 420 milliampere operation. However, when air is passed over the lamp, these optimum points are changed.

Air Velocity Effect

When a sterilization lamp is subjected to air velocity, the bulb is cooled which causes the lamp output to change. Figs. 2, 3, and 4 give the ultraviolet outputs resulting from operating the lamp at ambient air temperatures from 30 to 110 F and subjected to air velocities of 100, 450 and 950 fpm, respectively. A comparison of these curves will disclose that the optimum output conditions change as the air velocity and ambient air temperature vary. Lamps designed to operate in still air decrease in output as the air velocities are increased. Lamp "A" was designed for operation in air ducts and it produces a comparatively uniform output regardless of air velocity at ambient temperatures between 60 and 90 F, while at ambient air temperatures above 90 F the lamp output actually increases as the air velocity increases. Fig. 5 shows the effect of air velocity on lamp output at an ambient air temperature of 80 F.

Direction of Air Flow

When the lamp is installed in the duct parallel to the air flow, slightly greater output will result under most conditions. However, the radiation from a lamp so placed in an air duct can travel only a short distance before being absorbed by the duct walls. The effectiveness of ultraviolet radiation in killing bacteria is dependent upon the length of time that the organism is exposed and the intensity of the rays. The lamps are most effective when placed perpendicular to the air flow and equally spaced in the center of the duct. This permits the ultraviolet rays to be directed down the length of the duct and allows the bacteria-laden air passing through the duct to be exposed to the radiations for the longest period of time.

Bacteria Tests

Bacteriological tests to determine the effectiveness of ultraviolet lamps in air ducts were made in a system in which air was delivered to an auditorium at the rate of 5800 cfm. In an enlarged portion of the duct — measuring 126 in. long and 72 in. by 28 in. — 12 lamps were placed in a row across the center of the duct and perpendicular to the air flow. The lamps operated at 420 milliamperes, were evenly spaced and the wiring was arranged in such a manner that various groupings of lamps could be operated to change the intensity in the chamber. In some of these tests the air flow rate was decreased to 3570 and 2670 cfm by changing the speed of the fan. No outside air was admitted in any of these tests, so all of the air was recirculated from the auditorium. The return air intake was at one end of the auditorium with supply registers on one side and near the ceiling. A sprayer containing a 24 hr culture of E. coli suspended in diluted broth was placed near the intake and was operated throughout the entire test.

The sampling of air was accomplished by placing 10 agar Petri plates at various places in the room and seeding for ½ hr. The sampling was taken alternately, first with the lamps on, then off, with a 20 min. period between each change.

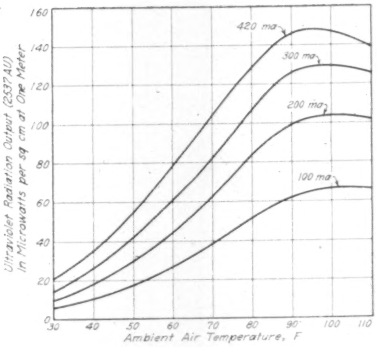
In still air this period of time would be too short to settle all of the organisms. However, the air in the room was recirculated six times per hr so that the rate of fall would not be governed by Stokes law. Preliminary tests showed that a representative sample of organisms could be obtained by the Petri plate method. During the seeding of the plates, a 5 cu ft sample of air was also obtained with a Luckiesh-Taylor[6] electrostatic collector. The two methods of sampling gave comparable results. The average results of 48 such tests with Petri plates and an equal number with the electrostatic collector representing approximately 500 Petri plates (Table 2) were taken over a period of many months and with relative humidities ranging from 24 to 60 percent.

As can be expected from tests of this nature, there is considerable variation in the survival ratio at different ultraviolet intensities and air velocities. These results obtained with an air flow rate of 5800 cfm are shown graphically in Fig. 6.

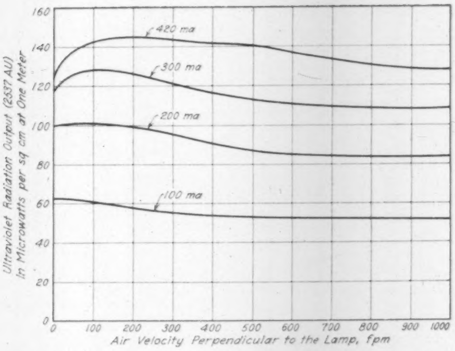
It can be seen that an exponential decrease law of the form,

$$P/P_o = e^{-KET}$$

where P is the number of E. coli surviving, P_0 is the number in the original air sample, E is the intensity



4 FOR 950 FPM air velocity perpendicular to the lamps the radiation output increases as the air temperature is increased



5 UNIFORM ULTRAVIOLET RADIATION output is achieved with lamp "A" operating in an ambient air temperature of 80 F and with increased air velocities. This lamp was specially designed for use in air ducts for ventilation and air conditioning

of germicidal flux, T is time and K is a constant, does not hold for organisms exposed at high velocities. Therefore, it would be incorrect to take any point on the curve, such as the amount of energy necessary to destroy 63.2 percent of the organisms, as was done by Luckiesh and Holladay[5] and calculate for some other percentage kill without taking into consideration the change in the slope at different survival values.

Improved Lamp

Previous to the introduction of the new sterilizing lamp, designated as "A," a large number of tests were made in the same duct using slightly different lamps. Only two flow rates were used, 5800 cfm and 2670 cfm, which correspond to 414 and 191 fpm, respectively. Using a humidifier, the organisms were sprayed and collected on Petri plates placed at random in the auditorium. During each test a 5 cu ft sample of air was also taken in the middle of the room, using a Wells centrifuge. An average of 61 determinations is shown graphically in Fig. 7 with a different lamp, designated as "B." Comparing the two curves, it can be seen that both ultraviolet lamps were more efficient at the higher velocity. It also shows that the reciprocity law in air ducts does not appear to hold as was observed in the previous tests with the lamps designated as "A."

To demonstrate more clearly the variations that occur in using different air velocities and sampling techniques, the data were calculated so a comparison could be made on an energy basis as presented in Table 3. It can be seen that less energy is necessary to destroy the organisms at higher velocities than at lower air velocities. Also the amount of energy needed to destroy 98 percent of the organisms at high velocity and low humidity is of the same order of magnitude[7] as similar organisms on Petri plates, namely 4500 to 5500 microwatt sec per sq cm. This is contrary to the reported conclusions of Wells[1] and of Luckiesh and Holladay[5] in that they state less energy is required to destroy organisms at low humidity than at high humidity. Since all of these tests were conducted at low relative humidities, 40 ± 8 percent, the results would indicate that at the survival values which are of practical significance, above 90 percent kill, moisture in the air per se, does not affect the vulnerability of the airborne organisms to ultraviolet radiations. At

TABLE 2—PERCENT OF SURVIVAL of E. coli exposed in an air duct to various numbers of two types of sterilization lamps with three air flow rates

Number of lamps		Percent of survival 5800 cfm	3570 cfm	2670 cfm
Lamp "A"*				
1	(a)	28.2	44.1	
	(b)	41.8	61.8	
2	(a)	12.3	54.1	
	(b)	15.6	60.9	
4	(a)	10.4		9.5
	(b)	20.1		14.3
6				3.6
				3.6
12	(a)	1.7	2.8	
	(b)	2.2		
Lamp "B"† (in vycor glass)				
4	(a)			40.6
	(b)			40.0
8	(a)	10.6		
	(b)	21.1		
20	(a)	6.5		6.8
	(b)	10.0		5.7
40	(a)	3.0		3.1
	(b)	3.4		3.6

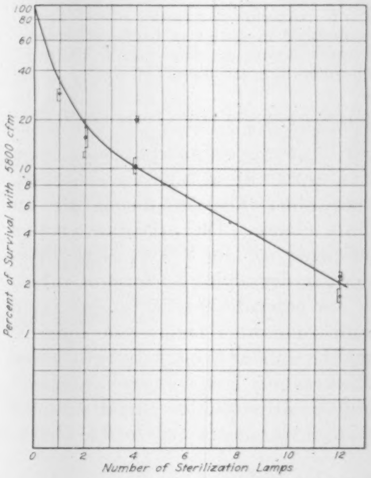
*E. coli sampled using Petri plates (a); Luckiesh, Holladay, Taylor collector (b).

†E. coli sampled using Petri plates (a); Wells centrifuge (b).

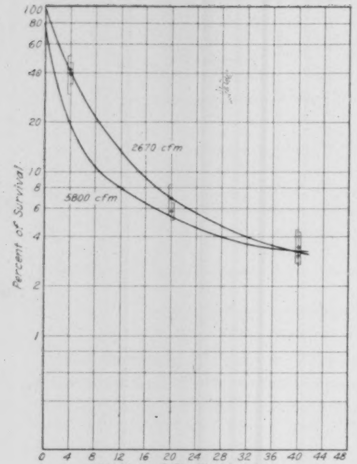
TABLE 3—CALCULATED ENERGY required for various percent of survival values using two types of sterilization lamps at different air flow rates

Lamp designation	cfm	Percent of survival	Microwatt-sec per sq cm
Lamp "A"	5800	36.8	369
		10.	1540
		2	3690
	3570	36.8	1245
	2670	36.8	1187
		10	2705
		2	4615
Lamp "B"	5800	36.8	251
		10	1370
		2	3805
	2670	36.8	782
		10	2610
Petri plates*		36.8	660-880
		10	3200-3700
		2	4500-5500

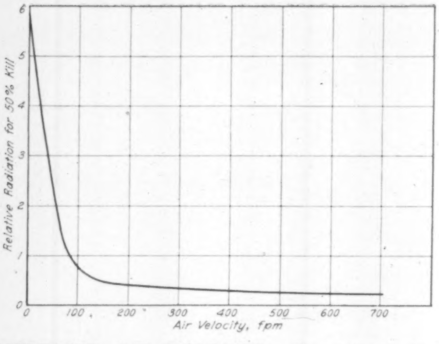
*Reference No. 7



6 PERCENTAGE OF SURVIVAL of bacteria decreases when the number of lamps is increased. The curve is for lamp "A"



7 **PERCENTAGE OF SURVIVAL of bacteria decreases when the number of lamps is increased and with higher air flow rates. These curves are for lamp "B"**



8 **WITH INCREASED AIR VELOCITY** ultraviolet radiation required to kill 50 percent bacteria is reduced

values of low percent kill, the quantity of energy required appears to be less, especially at high air velocities, than when these organisms are on Petri plates. The apparent greater efficiency of the ultraviolet radiations in destroying bacteria at values of low percent kill must be associated with some other factor than humidity. The greater bactericidal efficiency of ultraviolet lamps experienced with higher air velocities would indicate that air turbulence may be this factor.

Air Turbulence

Increasing the air velocity in any duct increases the air turbulence. In most air conditioning systems the Reynolds number, which is a measure of turbulence, is usually in the vicinity of 200,000; this is well within the range of turbulent flow. However, the Reynolds number for some of the tests in the small experimental air ducts such as used by Whisler[2], Luckiesh and Holladay[5] or Rentschler and Nagy[4] was as low as 6000, which indicates that very little air turbulence existed. At low or zero air velocities, Rentschler and Nagy have shown the amount of energy necessary to destroy the organisms is of the same order of magnitude as on Petri plates, regardless of the relative humidity. However, when Rentschler and Nagy increased the velocity in their 24 in. duct above 333 fpm, which increased the Reynolds number to over 34,000, the amount of energy necessary for 50 percent survival was decreased to approximately one-fifth of the values for identical organisms on Petri plates, as shown in Fig. 8. The results of Luckiesh and Holladay[5] show that by inserting baffles and increasing the air velocity, the amount of energy needed for 66.2 percent survival was decreased. The present results also show that as turbulence is increased by increasing the air velocity, the vulnerability of the organisms to ultraviolet radiations appears to increase. Some of the organisms in the turbulent flow must receive more radiation than would be expected from the average calculated intensity and time.

Lamp Location

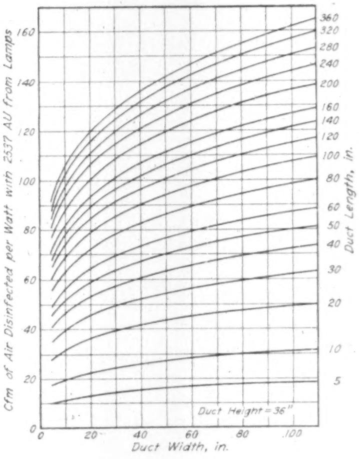
In order to utilize the ultraviolet radiations of sterilization lamps to the fullest extent, several arrangements and locations have been studied. When the lamps are placed parallel to the air flow, the air-borne bacteria traveling through the duct are irradiated only while they move opposite to the lamp. The radiations emitted from the lamp can travel only a short distance before being absorbed by the walls of the duct, which is especially true if the lamps are mounted on the walls of the duct. The same lamps placed perpendicular to the air flow are much more effective because of a greater "ray-length". However, if the ultraviolet lamp has not been designed for operation in moving air, both the output and maintenance may be unsatisfactory. As an example, the output of the new lamps operated at different current ratings varies in efficiency depending upon the air temperature and velocity. Lamps designed to operate in still air would show a much greater variation in output. The most effective arrangement of the lamps operated at 420 milliamperes in ducts has been found to be with the lamps perpendicular to the air flow and equally spaced in a single row at the center of the duct. In this position the greatest "ray-length" is obtained with minimum shadow effect.

Practical Application

Using the information obtained on the large air duct operated at 411 fpm, calculations were made to determine the amount of energy needed to disinfect 90 percent of the air in various size ducts using E. coli as the test organism. Fig. 9 shows that the efficiency of the installation increases with the size of the exposure chamber as would be expected from the increase in "ray-length". This set of curves may be used in calculating the amount of ultraviolet energy necessary for most ducts. However, in certain large irradiation chambers, the length may be as short as 2 ft while the width and height may be several feet. In such instances, the chamber can be theoretically divided into two or more sections to simplify calculations. The "ray-length" will increase with the size of the exposure chamber, and, therefore, less ultraviolet energy will be required. A correction factor for the increased "ray-length" has been calculated for various large chambers, as shown in Fig. 10.

All calculations of the amount of energy for various size ducts were based on actual energy measurements in a non-reflecting duct. Some increased output can be obtained by increasing the reflectivity of the duct walls.

To determine the amount of energy

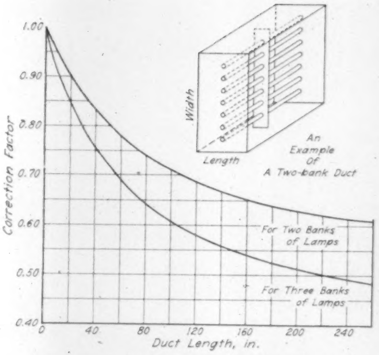


9 QUANTITY OF AIR that may be disinfected for killing 90 percent bacteria. These curves are for lamp "A"

necessary to destroy the organisms for other than the above survival ratio of 10 percent, the experimental curve in Fig. 6 should be used. For example, the results show that to obtain a smaller survival value it will be necessary to multiply the ultraviolet wattage obtained for 90 percent disinfection by the following:

95 percent kill	1.5
98 percent kill	2.5
99 percent kill	3.3

This data would most nearly approximate the values to be expected in air conditioning systems. Data obtained on small experimental units wherein the turbulence is low cannot be extrapolated to large size ducts.



10 CORRECTION FACTOR to be applied to values determined from Fig. 9 when two or three banks of lamps are used

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Need Cooperation in Construction

. . . *HPACCNA head tells UA*

THE ONLY WAY I know of for any of us to 'get more out of '54 is to get out and *do* more in '54," said Robert W. Lawinger, president of the Heating, Piping and Air Conditioning Contractors National Association, in in an address given in Washington, D. C. at a meeting of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the U.S. and Canada.

Mr. Lawinger noted that "the amazing thing about our free enterprise system is that it is not *free*—it has to be *earned*."

"Only as we increase the rate of output of the goods and/or services each of us is responsible for producing, can we have higher 'real wages' — equivalent to having a higher standard of living," said the speaker.

A great challenge will be to keep costs down, said Mr. Lawinger, and the best advertisement for both the contractor and union labor is a job well done. This means an "efficient job from beginning to end, a prompt supply of necessary materials and equipment on the job, an adequate number of skilled journeymen to make the installation, and qualified journeymen who are willing to assume the responsibility of running a job—men who appreciate the fact that inefficiencies such as unnecessary loss of time and tools is actually a personal loss to them, because it is the customer who eventually pays the higher cost and it is he who furnishes the all-important job opportunities." The key to the situation, the HPACCNA president feels, is cooperation and mutual confidence among business and labor.

"The construction industry has become a bellweather of the nation's economy as a whole, and because it has so many ramifications affecting the overall scheme of things, it is a sensitive indicator of our economic health and well-being as a nation.

"Since construction plays such an important role in underpinning our economic structure, it is of the utmost importance that both labor and management recognize their individual responsibilities in helping to promote and maintain a high level of construction activity," he said.

"Good management-labor relations will greatly aid in maintaining a high level of construction activity, and in my judgment the most essential ingredient for good management-labor relations is *good faith* on each side," he said.

"We oppose any agreements containing clauses which are discriminatory to members of local associations affiliated with the Heating, Piping and Air Conditionins Contractors National Association," Mr. Lawinger said. "Such clauses seriously affect members of local associations in the conduct of their businesses, by providing the holders of such agreements with a sales advantage over contractors having local agreements and interfere with the normal processes of collective bargaining. Although the number of men employed by these national agreement contractors is small in comparison with the number employed by local contractors, they are responsible for creating unnatural working conditions in some areas, for the member contractors who year in and year out employ the majority of UA journeymen, and cooperate with the UA in programs that benefit both the industry and the public," he stated in concluding his remarks.

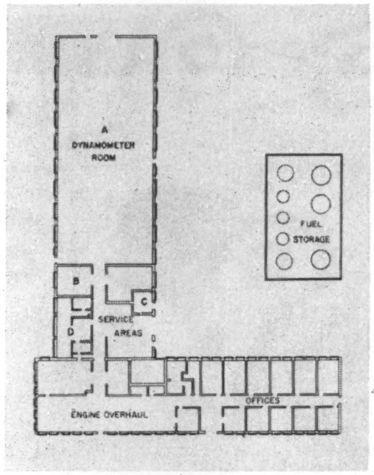
1 THE NEW LABORATORY is a single story structure with many special ventilation features to make working conditions pleasant

New Automotive Laboratory Has Special Ventilation Features

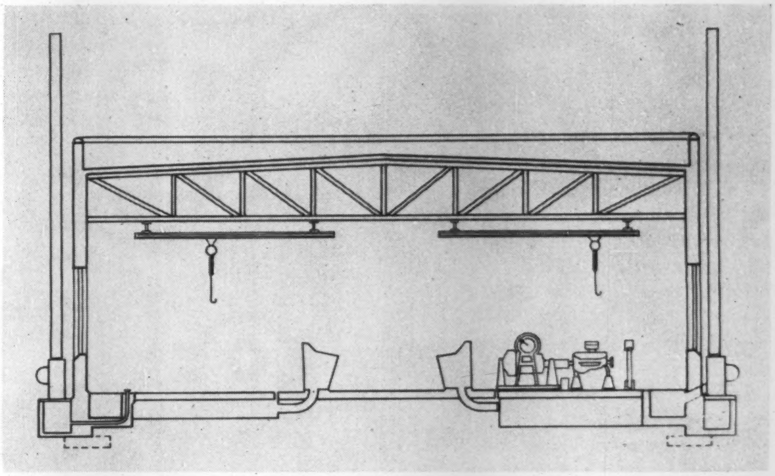
By Norman R. Olson, Staff Engineer
Utility Design Dept., Whiting Refinery
Standard Oil Co. of Indiana

• Ventilation is an important and necessary factor in this new automotive laboratory. Special features are described in the ventilation of the dynamometer room, the degreasing room, the ethylizing room and the locker room. Engine exhaust gases are removed by delivering them from the engine through stainless steel tubing to a separate exhaust system along each side of the building. 20,000 cfm of make-up air is supplied to the dynamometer room for the two separate exhaust systems in this room. A special hood was designed for spray cleaning, and a unique method of supplying 2000 cfm of make-up air to the ethylizing room is described. Even the lockers are ventilated. The ventilation system is proving to be of help in maintaining desirable and safe working conditions by efficiently removing fumes, contaminated air and smoke, and by supplying clean filtered air into the working areas.

THE NEW automotive laboratory of the Standard Oil Co. of Indiana at Whiting presented many special ventilation problems when it was designed. The laboratory, recently completed, is shown in Fig. 1. It is a single story L-shaped structure as shown in the plan of Fig. 2. The front section is an office and an engine overhaul area approximately 150 ft long by 40 ft wide. In order to reduce noise in the offices, the office and engine overhaul section are separated from the dynamometer room by a receiving area, wash and locker room, cleaning room, ethylizing room and special devices room. The sections that offered the ventilation problems are indicated in Fig. 2 as *A*, the dynamometer room; *B*,



2 THE FLOOR PLAN of the new laboratory is L-shaped and is divided into two separate sections



3 A CROSS SECTION of the dynamometer room is shown here. Also, the concrete trenches which extend along the outside walls of the building are shown

the cleaning and degreasing room; *C*, the ethylizing room; and *D*, the locker room.

Dynamometer Room Ventilation

In the ventilation design for the dynamometer room, it was necessary to consider engine tailpipe exhaust, pipe trench exhaust, general room exhaust for summer heat dissipation, the method of air supply and distribution, and heating. Engine exhaust gases are removed by delivering them from the engine through stainless steel tubing to a separate exhaust system along each side of the building. Because water is injected into the tubing near the manifold flange to cool the tubing and to reduce exhaust noise, corrosion was a problem. Stainless steel pipe is therefore used to carry the gases to a reinforced concrete duct underground and outside the building. The trenches, one on each side of the building, can be seen in Fig. 3, which is a cross section of the dynamometer room. The trenches are covered with concrete slabs as a blowout protection.

Each of these two trenches is exhausted by a 4500 cfm stainless steel exhaust fan which discharges the mixture of gases, air and water vapor through a 16 in. round stack that extends above the roof line.

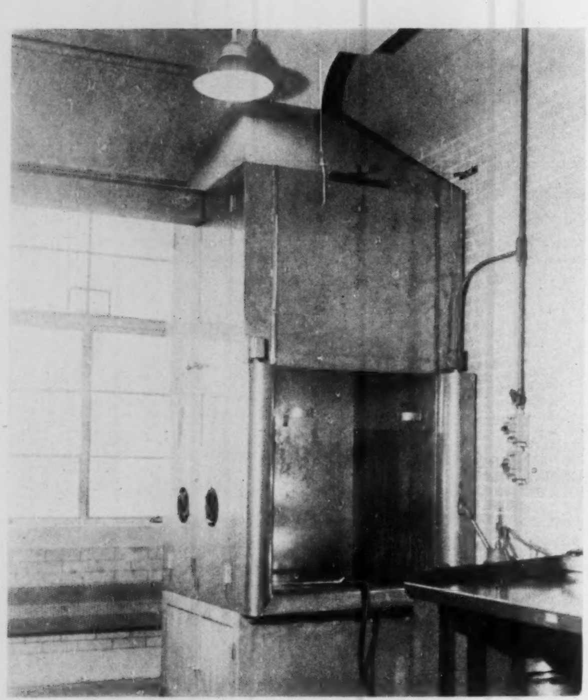
A suction pressure of $^3/_4$ in. WG is maintained in these trenches by the use of a gooseneck which extends above the ground at each end of each trench. A barometric damper is provided in the stack of the gooseneck, and in this way the desired vacuum in the trench is maintained.

4 THE OPERATIONAL EQUIPMENT in the dynamometer room is located in an efficient, open manner which is proving to be convenient, easy to clean and maintain, and cheerful. The make-up air supply outlets are along the outside walls above head level

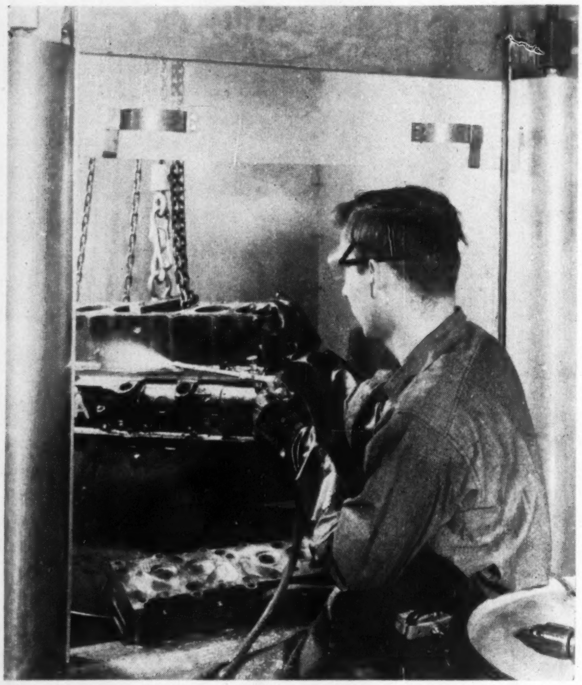
There is also a system of trenches to carry piping, electrical power and instrument lines. These ducts are shown in Fig. 3 just inside the building and under the floor.

The crankcase breather pipes are also connected by flexible metal hose to the trenches. Additional supply air enters the trenches through loosely constructed cover plates. This system is exhausted by two 2500 cfm exhaust fans, one on each side of the building, and the resulting air change in the dynamometer room trenches is one per minute. This exhaust air is carried above the roof line through a 12 in. round stack.

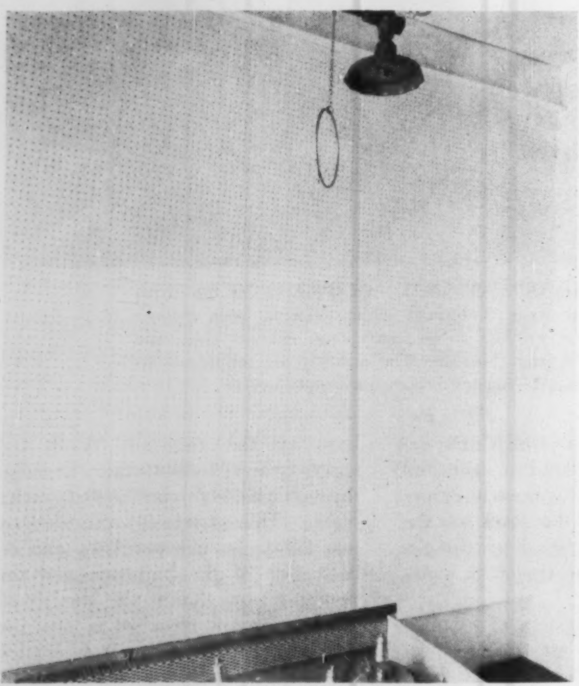
In addition to the two exhaust systems mentioned, there are two 25,000 cfm roof exhausters to dis-



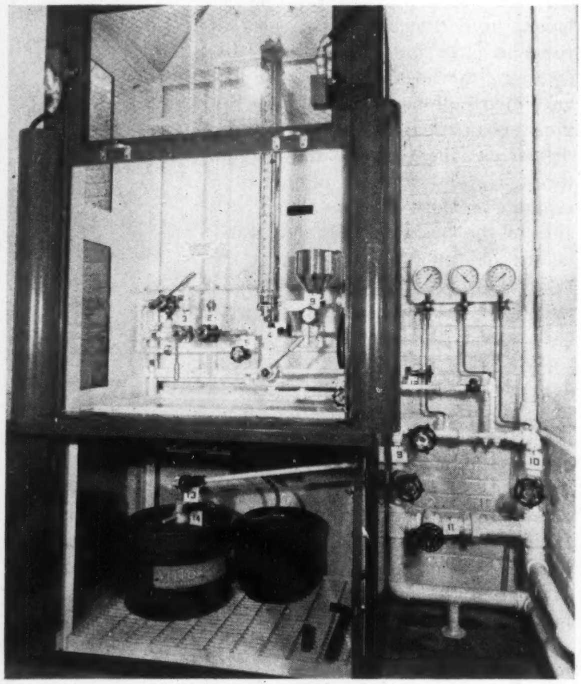
5 THE SPRAY CLEANING HOOD was designed for a face velocity of about 200 fpm, which provides an exhaust flow rate of 2000 cfm



6 THE SHAPED ENTRANCE of the hood for spray cleaning was designed to minimize the possibility of fumes infiltrating out into the operator's face



7 THE MAKE-UP air is admitted into the ethylizing room through an 8 ft x 10 ft orifice plate, with 3/16 in. holes, along one wall



8 THE HOOD for the ethylizing room presented a special problem of providing two air changes per minute to satisfy the hood requirement of 2000 cfm sipate summer heat and for any emergency air dilution which might be required.

20,000 Cfm of Make-Up Air

Filtered and heated make-up air is furnished to the dynamometer room by a 20,000 cfm supply system and distributed through adjustable outlets above head level, which are shown along the outside walls in Fig. 4. Each of these 12 in. round outlets discharges 1500 cfm into the space. These outlets are directed toward the operators for summer spot cooling.

During winter operation, they are directed so as to maintain a circular motion of air around the room. Heating coils in the supply system are of sufficient capacity to heat the room. A room thermostat on the one inside wall controls the flow of steam to the air heaters.

Some of the air supplied to the dynamometer room passes through louvers to the cleaning room that contains a spray hood and a degreaser.

Special Spray Hood

The spray hood shown in Fig. 5 has a turntable for positioning engine parts. An operator is shown at work in Fig. 6. The hood was designed for a face velocity of approximately 200 fpm, which provides an exhaust flow rate of 2000 cfm. The shaped entrance, as shown in the photograph, was designed in this manner to reduce turbulence and thereby reduce the possibility of fumes infiltrating out in the operator's face. A slot is also provided between the shaped entrance and the hood proper through which some of the air is pulled into the hood. Fluorescent lights in back of the curved section illuminate the hood interior.

In the ethylizing room, the problem of providing two air changes per minute to satisfy the hood requirement of 2000 cfm was presented. The air to this room was admitted through an 8 ft x 10 ft orifice plate, shown in Fig. 7. This plate, with 3/16 in. holes, was designed to maintain 0.05 in. WG plenum pressure. The plenum chamber behind the orifice plate is 6 in. deep. The air is delivered to the plenum through a 12 in. x 12 in. duct which transforms into a 12 in. x 6 in. duct extending the entire length of the plenum. The hood in this space was designed with a shaped entrance also, and this space has its own tempered and filtered make-up air system.

Even Lockers Are Ventilated

Air is exhausted from the wash and locker room through the shower area, toilet area and from a triangular duct which extends along the top of the lockers. Air enters the lockers through louvers near the bottom and passes through perforations in the locker tops into this duct. Approximately 7 cfm is exhausted from each locker in this manner.

The entire laboratory — except the dynamometer room — is heated by direct radiation with the ventilation air being tempered only.

The operational equipment has been designed and located in an economical, open manner which is proving to be convenient, easy to clean and maintain, and cheerful.

The ventilation system has helped to maintain desirable working conditions by efficiently removing fumes, contaminated air and smoke, and by supplying clean filtered air into the working areas. The result has been not only a clean and desirable area in which to work but also a safe and healthful one.

Select the Pump for the Job

. . . says C. T. Baker

GOOD JUDGMENT is sometimes not exercised when selecting a piece of equipment that will be used only a few weeks, and possibly only a few days in the entire year. Rather than select a pump, an engine or a boiler in keeping with the limited service that it will be called upon to perform, a much more expensive piece of equipment may be recommended merely because of its greater efficiency.

When making a comparison between the cost of a very efficient pump and one of less efficiency, it is well to consider the matter in terms of how many years it will take to amortize the difference in cost of the two pumps when the percentage of annual operating time is just a small part of the total hours in a year.

It may be discovered that the power or fuel savings, as the case may be, may not justify the extra cost during the 25 to 30 year life expectancy of a pump intended for this type of service. When a pump, blower or any other equipment used in a plant must operate around the clock for the greater portion of the year, efficiency of course plays a more important role in the overall costs of plant operation than it does for less continuous service.

For example, pump *A* has an efficiency of 60 percent and pump *B*, an efficiency of 65 percent. Assume that the motor driving each pump is equal to the other in efficiency at the load required and the output of each pump in theoretical hp is 42.

Then,

Pump A: $42/0.60 = 70$ hp
Pump B: $42/0.65 = 64.6$ hp
The difference: $= 5.4$ hp
(in favor of pump B)
or $(5.4 \times 100)/70$
$= 7.7$ percent saving in hp

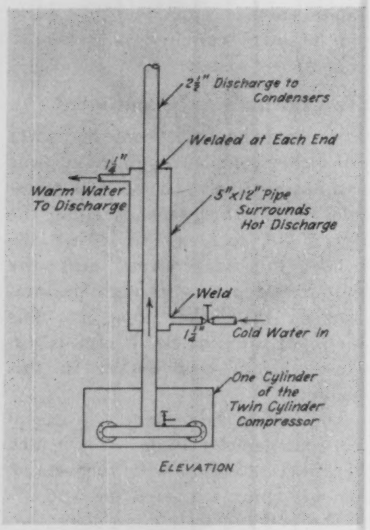
If the pump operates 24 hr per day for 300 days per year, and the current to operate the motor costs $0.0125 per kw, then the extra 5.4 hp — assuming a motor efficiency of 85 percent — would represent:

$5.4/0.85 = 6.4$ kw input
6.4×24 hr per day $= 153.6$ kw per day
153.6×300 days $= 46{,}080$ kw per year
$46{,}080 \times 0.0125 = \$576.00$ annual savings

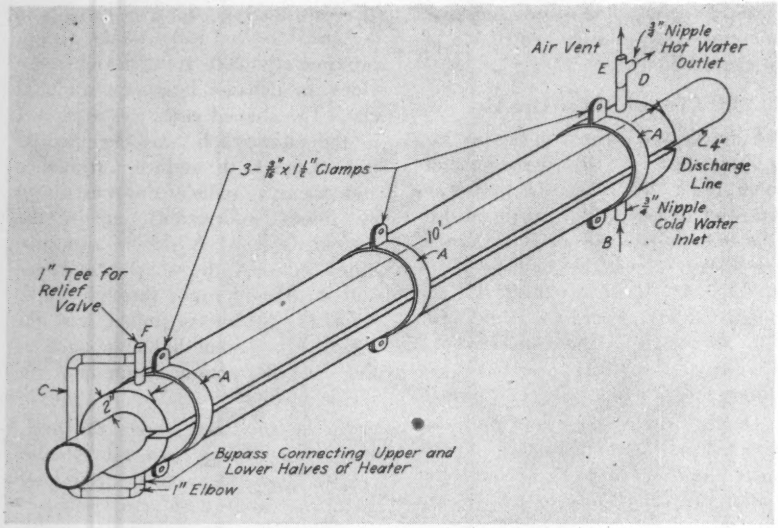
The annual saving in power cost favors the more efficient pump.

The above example can serve as a guide in determining the power saving for any given case. It will also permit a quick calculation on the length of time that would be required to amortize the higher first cost of the more efficient pump.

After the extra first cost has been recovered through the lower operating cost with the more efficient pump, the savings are a net gain during the life of the unit—C. T. BAKER, Consulting Engineer.


2½" Discharge to Condensers
Welded at Each End
1¼"
Warm Water To Discharge
5"x12" Pipe Surrounds Hot Discharge
Weld
1¼"
Cold Water In
One Cylinder of the Twin Cylinder Compressor
ELEVATION

1 THE DISCHARGE PIPE of the compressor was equipped with a heat exchanger to supply warm water for thawing ice


Air Vent
¾" Nipple Hot Water Outlet
E
D
3-3/16"x1½" Clamps
A
4"
Discharge Line
¾" Nipple Cold Water Inlet
B
10'
A
1" Tee for Relief Valve
F
A
C
2"
Bypass Connecting Upper and Lower Halves of Heater
1" Elbow

2 PROBLEM WAS CORRECTED by designing this pipe jacket. The water to be heated is contained within the shell and does not come in direct contact with the compressor discharge pipe. The two halves of the jacket are tightly clamped to the discharge pipe as shown at *A*

Changing Plant Piping

By C. T. Baker
Consulting Engineer

. . . corrects corrosion in one case and saves heat in another

Case Histories from a Consulting Engineer's files

PIPING PROBLEMS are common to practically every type of industrial plant. Here are two cases where the piping was changed to correct problems. One refers to an ice plant, and the other to a laundry.

CASE NO. 1 —

Ice Plant Piping Problem

Clearing up operating problems in a large ice plant can offer many challenges. One problem that required solution in such a plant not long ago involved the discharge pipe of the horizontal duplex ammonia compressor. The pipe was equipped with a heat exchanger to supply warm water for thawing the ice loose from the cans at the ice dump. Cold condensing water entered the heater at the bottom of the vertical shell, and the heated water was discharged near the top. The piping arrangement is shown in Fig. 1.

After several years of service, the bottom of each shell developed a leak at the welded joint. As soon as the leak was discovered, the inlet water connection was removed to determine what had been responsible for the greatly reduced flow to the can dumps. When the short 1¼ in. section of pipe between the stop valve and shell was removed, the back flow of hot water carried quantities of rust.

It was then decided to remove the 5 in. shell to permit an examination of the exterior surfaces of the discharge pipe. This was done with a gas cutting tool, and when the shell was removed, it was found that it was packed with rust — much of which had come from the discharge pipe.

After cleaning the surfaces of the section of discharge line that had been encased in the 5 in. pipe jacket, an interesting discovery was made. The discharge pipe — which fortunately was of extra heavy construction — disclosed that in many places the original metal had rusted more than halfway through the wall thick-

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Mr. Baker, consulting engineer specializing in heating, piping, air conditioning, refrigeration and power, draws upon cases from his wide experience to cite examples of how two piping problems were corrected.

ness. A small gas heater was installed to replace the pipe water heater, and at the close of the ice season, the original section of discharge for each cylinder was replaced.

An examination of the water used for thawing purposes by a chemist disclosed a high CO_2 content which, along with oxygen, had been responsible for the corrosion that soon would have become serious.

In discussing this matter with an engineer in another section of the country who had a water heating hookup of the same type, he corrected the situation, after experiencing similar difficulties, with the design shown in Fig. 2. In this design, the water to be heated is contained within the shell itself and does not come in direct contact with the compressor discharge pipe. The two halves of the heater are tightly clamped to the discharge pipe as shown at *A*. The water to be heated enters the bottom half of the heat exchanger at *B* and flows longitudinally to the opposite end. Then it flows through the 1 in. bypass loop, *C*, to the top half of the exchanger and finally leaving at *D*. An automatic air vent is provided at *E* and a pressure relief valve at *F*.

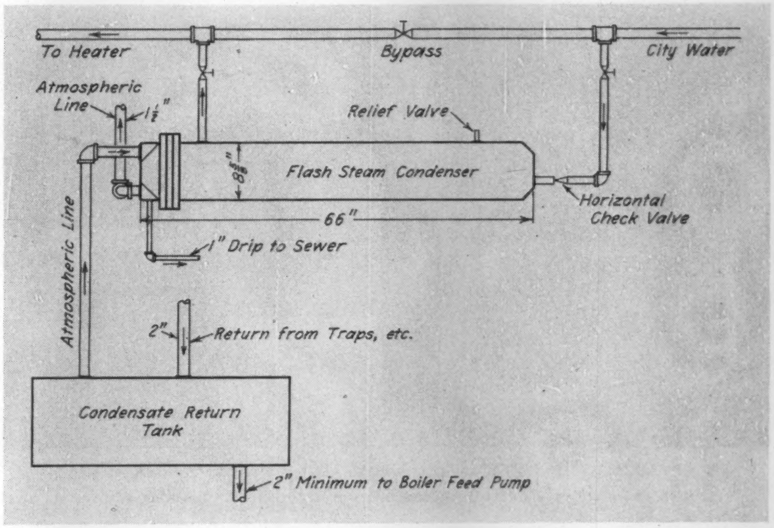
With the improved design, there is ample surface contact between the top and bottom sections of the heat exchanger and the discharge pipe to supply all the warm water needed for ice thawing. Should this exchanger develop leaks, resulting from corrosion, it may be easily replaced.

It is a good idea to install a thermometer on the water outlet, and if desired, a thermal control valve may be placed on the water inlet connection for holding the temperature to any predetermined point — or at least close enough for all practical purposes.

CASE NO. 2 —

Laundry Piping Corrected

A laundry experienced considerable difficulty during the winter months caused by low steam pressure. A 72 in. x 18 ft hand fired boiler was taxed to the limit during cold weather in supplying the steam requirements for space heating, water heating, presses, ironers and other steam equipment common to a modern laundry.



3 **THIS FLASH STEAM condenser proved to be a real waste heat reclaimer, which helped to maintain an ample supply of hot water and steam**

Hot water was supplied by a water heating tank 60 in. in diameter by 8 ft, fitted with the usual steam coil. Cold water entered the heating tank from the city mains at a temperature of about 80 F in the summer and about 50 F in the winter. It was the water that entered the tank in the winter that caused most of the steam supply problems.

Hot condensate from all sources was returned to a receiving tank in the boiler room from where it was delivered to the boiler by a motor driven boiler feed pump. A vent in the top of the tank shell provided atmospheric relief for flash steam.

Since the hourly heat release to the atmosphere was quite large due to the total heat in the steam at 125 psig, it was decided to recover this heat for preheating the city water before it reached the heating tank.

The solution of this problem was accomplished by the installation of the waste heat reclaimer as shown in Fig. 3. It proved to be the answer to the problem of steam supply. Not only was there always plenty of hot water following the installation of the waste heat reclaimer, but ample steam was available at the required pressure at all times. One of the rewards for the money invested in the heat exchanger was a sizable reduction in the fuel bill.

Considering the comparatively small investment required to recover waste heat from steam traps and from other sources of heat loss, it is difficult to understand the reason for such waste when valuable heat can be so easily recovered.

Aluminum Alloy for Pressure Vessels Approved

. . . by ASME committee

MANUFACTURERS and users of unfired pressure vessels are offered a new construction material with the recent approval of aluminum alloy GR40A (ASTM designation) by the boiler code committee of the American Society of Mechanical Engineers.

Approval of this alloy became effective with the publishing of ASME case 1174, which permits the construction of unfired pressure vessels of the alloy in accordance with the rules of section VIII of the 1952 ASME boiler and pressure vessel code.

While the alloy is more expensive than 3S and 4S alloys on an equal weight basis, it is more economical on the basis of equivalent strength, according to the Aluminum Co. of America, as the weight saved in vessels fabricated from this alloy will normally more than offset the increased cost per pound, and the lighter weight in itself is often a valuable advantage. These economies are expected to open up entire new fields for aluminum.

A TECHNICAL SURVEY of the field of dust collection equipment which is used in conjunction with industrial exhaust systems was the subject of this session

Industrial Ventilation Conference

. . . held at Michigan State was real work-out with classroom sessions and talks by authorities in the field

THE THIRD ANNUAL industrial ventilation conference held at Michigan State College, East Lansing, followed the pattern established by the two preceding conferences, provided for a limited number of "talks" on different phases of the problem with the balance of the time spent in classroom sessions. The theme of the conference can be summarized as follows:

"A complete ventilation system for modern industry must have (1) proper hood and duct design, (2) the fan must not only be of correct capacity, but also properly installed, (3) the collector must be carefully selected to assure efficiency, low maintenance, possible reclaiming of material and handling of waste, and (4) comfort and make-up air must be considered together and must be provided if the balance of the system is to work as designed."

The conference was co-sponsored by the division of occupational health of the Michigan Department of Health, and Michigan State's school of engineering. The nearly 200 people registered for the conference from 15 states and Canada consisted of plant engineers, contractors, consulting engineers, industrial hygienists, educators and others interested in the ventilation field.

A Working Course

Because of the intensive program, the conference has become known as a working course. Although the program leaves only one evening free for social activities, many friends are made because of the informal atmosphere carried on through the meeting. It was pointed out by James Barrett, ventilation supervisor of the Michigan Department of Health, who was responsible for the conference this year, at the first general session that formality was out and first names were in order from then on. This informality was carried on throughout the meeting and was an aid in getting good discussion periods at the sessions.

After the opening session Monday morning, classroom work followed the talk or demonstration which was given after each breakfast and lunch — the group ate all meals together except Tuesday dinner — save for the open forum on Tuesday. Each registrant had a choice of one of three groups in which he could participate: (1) basic design problems to include all fundamentals and detailed calculations for a balanced duct system, (2) design of more complex systems, including hood design and collector selection, for which the registrant must have had previous training in balanced duct design, (3) design of ventilation control for various operations, including selection of collector, fans, air make-up, etc., for which the person selecting this group must have had previous training and knowledge of industrial ventilation including hood and duct design. All of the problems involved the exhausting of fumes, vapors, gases and dusts to help each person to understand the basic problems involved.

As usual, the discussion in each class was the real "meat" of the conference. The instructors were there to lead the class and to keep them headed for their ultimate goal, not to dictate.

By special cooperation with the ventilation committee of the Conference of Governmental Industrial Hygienists, the new enlarged edition of the Ventilation Manual was used as a text. This manual of recommended practices has proven to be an invaluable aid in the solution of industrial ventilation problems and may be purchased from the Committee on Industrial Ventilation, P.O. Box 345, Lansing, Mich., for $3.00.

History Reviewed

Professor W. A. Cook, of the University of Michigan, chairman for the day, opened the first session. After welcoming the group, he told how industrial ventilation and industrial hygiene were inseparable. He followed by introducing Professor C. H. Pesterfield, of Michigan State College, who talked about the history of industrial ventilation. Professor Pesterfield pointed out that the subject has been of general interest for only about 75 years, and that although statutes were placed on the law books about 50 years ago, real engineering on the subject has been devoted to the subject for only the last 20 years. Back in 1911, the ASHVE invited a doctor to speak at one of its meetings on air requirements. Although he asked questions about temperature, volume, humidity, air flow, cleanliness and other subjects which we now consider as a part of comfort, no answers were forthcoming. It was not until the early '20's that the society started to explore the subject. Since that time, a considerable amount of research has been conducted that has provided many of the answers.

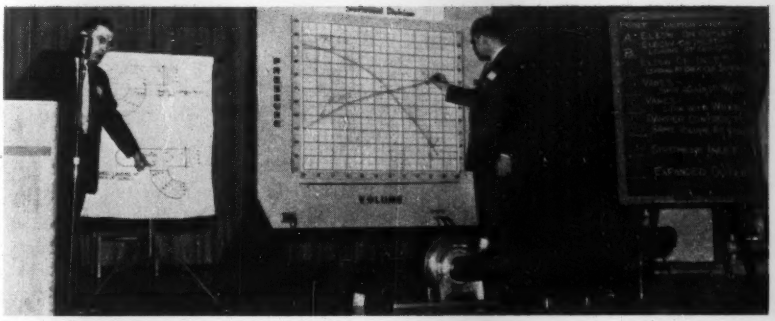
Air Flow Measurements

B. D. Bloomfield, ventilation engineer with the Michigan Department of Health, put on the first demonstration of the course. By the use of a fan, ductwork and large hood, he was able to show how the various air flow measuring instruments are used and what results might be expected.

The observations made with different instruments were tabulated and later compared. Some differences in air volume were found with the different methods, which further emphasized the care which must be taken in the use of any instrument. It was apparent that any of the equipment used in this demonstration would be suitable for field use if properly applied.

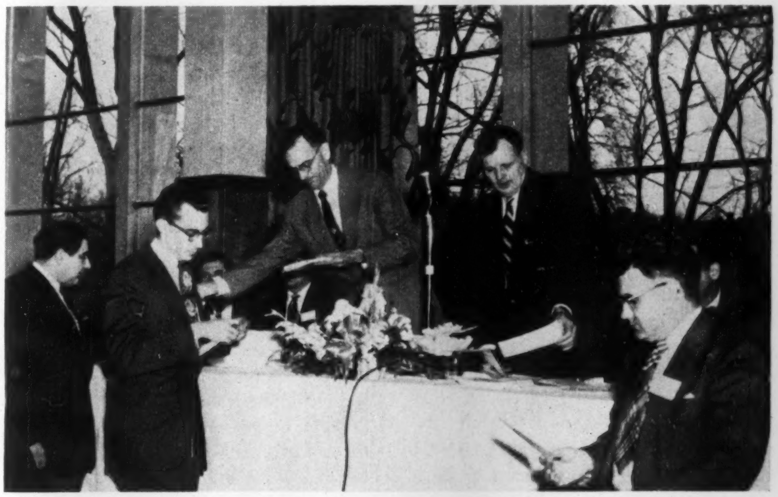
Ventilation Manual

George Hama, industrial hygienist with the Detroit Department of Health, introduced the ventilation manual to the conference. He told how it had been put together originally by the industrial health division of the Michigan Department of Health for its own use and then later turned over to the Conference of Governmental Industrial Hygienists to publish, if they so decided. The conference set up a ventilation committee which made some changes and then had it published.



THE EFFECT OF FAN connections on performance was demonstrated by the fan characteristic curves and model equipment shown here

CLASSROOM PROBLEMS and discussions made up the major part of the conference, which permitted all of the registrants to participate in an informal manner



CERTIFICATES WERE presented on the last day of the conference to all of the registrants who completed the course

He was careful to explain that it is a manual of recommended practice and not a code. The aim of the committee was to offer a practical manual that could be easily used by all the people in the field and still have it priced economically so that anyone could afford it.

The first aim was obtained by the use of a minimum of technical language and the use of about 600 drawings to explain the text. The second aim has been brought about by the type of printing and binding and the large sales. Copies have now been sent to most of the countries in the world.

The coverage of the manual is

wide, including general principles, dilution, comfort, hood design, duct design, make-up, and air cleaning, as well as a number of other subjects. Of special interest are over 50 specific installations showing details such as the air volume, velocity and pressure drops.

Effect of Fan Connections

A particularly interesting demonstration at the conference was the one showing the effect of fan connections on fan performance, by William Tracey. This was a demonstration which was developed especially for the conference. He showed, by the use of manometers, in a good visual demonstration how connections affect the fan rating.

Mr. Tracey stated that everyday plant engineers, maintenance men and outside consultants design and install all types of fume and dust control, material conveying, and ventilation systems. Data is available for sizing ductwork and hoods and calculating duct resistances. Fan selection data is available from manufacturers' published catalogs. At times, however, the objective of the installation is not attained, and this discrepancy may be attributed to the effect of the duct connections to the fan upon the fan performance. The purpose of this demonstration was to illustrate how fan connections affect fan performance.

The model used in the demonstration consisted of a standard small motor driven cast iron radial type fan, built by all fan manufacturers. A discharge duct, complete with pitot tube and a variable orifice, was used. Static pressure, total pressure and velocity pressure readings were taken simultaneously, and transferred to differential manometers which formed the ordinates and abscissae of a graph. The set-up was similar in all respects to Plate 1 of the NAFM code, with the exception that the pitot tube was fixed. Pressure-volume and horsepower-volume curves were drawn which were used as reference points. Various fan inlet and outlet connections were made, noting their influence on the fan performance.

He showed that when an elbow was installed at the end of the test duct, it was indicated additional resistance had been added, and the volume, pressure and horsepower changed in accordance with the reference curves. If the elbow had a smaller radius, the changes would be greater. If it were possible to mount the elbow directly at the fan discharge, the results would be more pronounced. The latter condition could not be illustrated because of the delicate adjustment of the manometers.

Placing the same elbow on the fan inlet tended to provide an unequal load on the wheel. If the elbow were positioned in such a way that unequal loading occurs at the fan cut-off, it would be necessary for the wheel to work on the air through the full 360 deg of the fan housing. Under these conditions, the volume and pressure would be reduced, and the horsepower would be increased when reference is made to the fan curve, he said.

Revolving the elbow 180 deg provides unequal loading of the wheel opposite the cut-off. Under these conditions, the volume and pressure would be the same as the previous case, but the horsepower would be somewhat less.

He explained further that the inlet duct connections may be arranged so as to create a spin of the air, either in the direction of wheel rotation or against the wheel rotation. Spin vanes applied to the fan inlet act so that the volume and pressure are reduced, and the horsepower is increased when the direction of spin is against the wheel.

Another set of vanes creating a spin in the direction of the wheel rotation showed that the volume and pressure are reduced approximately the same amount as above, but that the horsepower is also reduced below the reference curve. In both cases, the degree of volume-pressure reduction depends upon the amount of spin created by the vanes. Fan manufacturers make use of this spin in the direction of wheel rotation as a volume damper with the consequent reduction in horsepower. The throttling damper was then closed down to give the same volume as obtained by means of the spin vanes. Under these conditions, the volume, pressure and horsepower fell right on the reference curve. This method of volume control is similar to that obtained by means of an outlet damper.

Mr. Tracey explained that the inlet of the test fan is similar to an unflanged pipe. The installation of a streamlined entrance piece to the fan inlet reduces the orifice loss and increases the volume and pressure, while the horsepower remains on the extended reference curve.

He also showed in the demonstration that an evasè stack can be used to increase fan efficiency. This was illustrated by the model wherein an evasè was placed at the end of the duct. The area of the evasè was twice that of the duct and it could be seen that the volume delivered increased on the extended curve and that the horsepower also follows its extended curve.

The effect on fan performance obtained by placing it too close to a wall was illustrated by the movement of a flat plate up to the model inlet. Generally speaking, the fan performance begins to be reduced if the distance from the inlet to the obstruction is less than one half of the wheel diameter, he explained.

Other "talks" and demonstrations given at the conference will be summarized in subsequent issues of HPAC.

1953 Was City's Cleanest, Dustfall Records Show

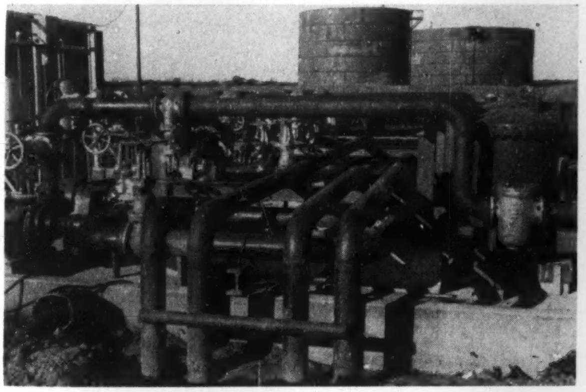
. . . according to scientists

THE YEAR 1953 was Chicago's cleanest on record, according to scientists at the Armour Research Foundation of Illinois Institute of Technology.

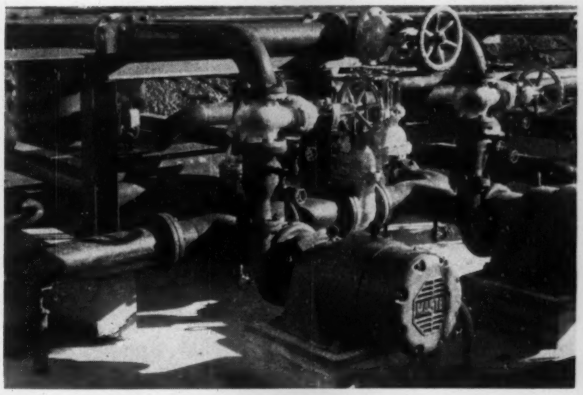
The city's average monthly dustfall for the year was 53.61 tons per square mile, it was reported by William A. Dupraw, research analytical chemist at the foundation. The figure represents a significant reduction from the average of 56.07 tons per square mile in 1952, the city's next cleanest year since ARF first started measuring and analyzing dustfall in 1946.

Mr. Dupraw said the 1953 dustfall record was good because the weather for the year — especially the last few months — was relatively mild. December, for example, averaged only 55.94 tons per square mile, which is considered light for a winter month.

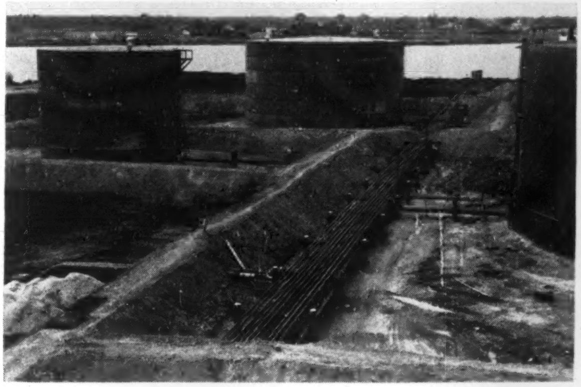
Dustfall is usually heaviest during the winter, he explained, because of the many heating fires in use. Other factors which affect dustfall are windy weather, which redeposits dirt and soot from one area to another; precipitation, which brings down the dust in the air; and air pollution caused by industrial, commercial and residential sources.



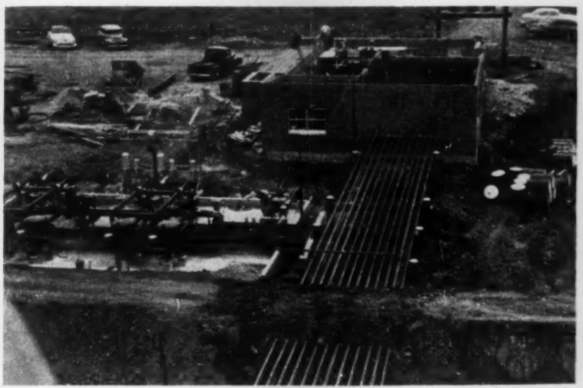
THE FOUR LINES in the foreground carry the petroleum products to the truck loading racks, and the pipes above lead from the storage tanks to filters and strainers, shown at the right



CENTRIFUGAL PUMPS are used to draw the petroleum products from the storage tanks and pump them to the truck loading rack at the rate of 650 gpm



FUEL AND FOAM lines extend through the terminal — the small lines on top are for foam fire protection and underneath are the flow lines for petroleum products. Two 10 in. lines at the left enter the system from the unloading dock



THE FOAM PIPING system — seen coming from the office and foam house —, the loading pump pad at the left and the pumps and strainers were all a part of the installation which was completed in 35 days

Versatile Piping Systems

. . . for marine oil terminal has many interesting features

THE VERSATILE PIPING systems for fuel and foam in the new marine oil terminal at Two Rivers, Wis., have many interesting features.

More than 16,000 ft of piping is installed in this new terminal. Sizes ranging from 3 to 10 in. connect the supply line terminus and storage tanks. Also, this piping system comprises the water and foam fire system. Work was completed only 35 days after construction was begun.

Gasoline and fuel oil are delivered by tanker and barge, then piped to six storage tanks having a total capacity of over nine million gallons. Truck loading equipment will fill gas and oil trucks at the rate of 650 gpm. Automatic valves shut off the flow when the truck is full, and trucks can be loaded every 10 min.

The fire-fighting foam generating system is one of the most modern in use. One man can control it. A pump pulls 1000 gpm of water from city mains, rushes it to foam generators where the proper amount of foam solution is added, then pushes it through two separate lines to the top of each storage tank. Troughs in each tank direct the foam solution down the inside to the oil surface, where it forms a foam blanket to extinguish the blaze.

(Photos courtesy of Dravo Corp.'s Machinery Div.)

GRANT'S GENERAL STORE

HERE'S a "shopping center" of many years ago that required very little mechanical planning for year 'round comfort, parking and lighting

Planning the Shopping Center

. . . for heating, air conditioning and other considerations

By R. J. Abramson
Consulting Engineer
R. J. Abramson & Assoc.

• This is the first of a group of articles on the factors to be considered in planning a modern shopping center. An overall approach to the problem is presented this month with a general outline of the engineering considerations, including provisions for heating and air conditioning. Subsequent articles will be devoted to detailed descriptions of several shopping centers, the mechanical designs for which the author's staff has completed.

THERE ARE TWO general types of shopping centers. They are the regional shopping center and the local shopping center.

The regional shopping center has more than a total of 150,000 sq ft of sales area and at least two sales units which are each in excess of 20,000 sq ft. The parking area requirements for such a center are 4 sq ft of parking area for every square foot of sales area, or a minimum of 600,000 sq ft.

The local shopping center has less than 150,000 sq ft, and its largest sales unit may be well under 20,000

TODAY'S SHOPPING CENTER must be comfortable all year 'round, must have ample parking facilities, good lighting and be accessible in all kinds of weather

sq ft. The parking area requirements are 3 sq ft of parking area for each square foot of sales area. Most generally, shopping centers are in the latter class, and this article will deal with this type.

One common denominator for a local shopping center can be stated as "a group of small, diverse retail shops under a common roof (or roofs) individually operated." Of course the individual shops must be designed to meet the tenant's budget and taste. Only the exterior architecture can unify the shop groups. The interior construction should be adapted for leasing changes in individual shops which will occur from time to time.

Ample Parking, Good Lighting

As most shopping centers are constructed on plots of ground ranging from 10 to 20 acres, they must be accessible in all kinds of weather. As space and utility flexibility are important for the individual shop, so it is important to provide proper drainage, parking and exterior lighting for the buyer's ease and identification of the center.

Ease of parking involves two distinct thoughts. They are automobile

The Modern Market Place — The Shopping Center

From time immemorial, humans have trafficked urban manufacture for suburban or rural produce. The kaleidoscope pattern of buyer and seller required only a common roof. A local point of exchange for artisans, artists, and agriculturists — a market place — a sheltered place for the display of merchandise — this is the recognized need of every town and village from time immemorial.

The creative and inventive genius of the people change the living conditions. The straw mat and carpet give way to the hitching post and store building, store buildings group together and public transportation is the catalyst between the buyer and the seller. The full blossoming of personal transportation — the automobile — means that groups of store buildings must have space for the buyer's car, as well as space for tending and entertaining the buyer's children. Today's shopping habits of the community create the need for a modern market place for all the family — the shopping center.

How is a modern shopping center born? In many cases a realtor will see the concentration of people, observe the way they travel to and fro, note the most common routes used, estimate the weekly purchasing potential, then try to secure a suitable site. After the site is optioned or purchased, the realtor obtains the services of an experienced architect. Site layouts and colored perspective drawings are prepared. From these drawings the realtor interests various well known national store operators.

When several important leases are signed, financing is obtained and construction drawings are prepared. Unleased sales space is left as a building shell for subdivision and finish for local merchant leasing. Leasing will determine the type of center.

access which includes traffic flow and parking, and parking area lighting. The former is developed by the site planner, but the latter is designed by the engineer.

There are two schools of thought for parking lighting, either high intensity or low intensity. From a distance, high intensity lighting creates a feeling of intense activity, but close by it seriously detracts from show window "eye appeal" because of the similarity of lighting levels between display and parking. Low intensity parking lighting attempts to compensate for this factor by providing just enough illumination to permit easy car identification with a slight increase in lighting level for pedestrian walks. This method permits high level show window illumination to be the effective factor in attracting the potential buyer's eye. Proponents of this method claim that it reduces the "distraction factor." Glare is also a major part of the distraction factor. Fortunately, this can be effectively controlled by suitable choice of luminaires, light baffling, mounting heights, and proper spacing of lighting standards.

Heating, A.C. Decisions

The following decisions regarding the planning and operation have been found to be the most frequent. The tenant is to maintain the heating and air conditioning systems or they are to be tenant installed, if so leased. The owner is to install the utilities to each sales space — special floor outlets and lighting, if so leased.

The owner is to install parking lighting, yard hydrants, rubbish incinerators, attraction lighting, and signs.

General engineering starts with the site. The location and topography of the shopping center give rise to the following factors:

a) Electrical distribution which involves local codes, 4 wire, 3 phase service, separate light, separate power and the matter of resale to the tenant.

b) Storm water drainage which involves local codes, open ditch drainage or underground pipe with terminal connection to the municipal system.

c) Sanitary sewage which involves local codes and the connection to the municipal system or a septic system.

d) Combined drainage which involves local codes and systems where both storm water and sanitary sewage are conveyed in a single pipe system with terminal connection to the municipal system.

e) Fuel gas system which involves local codes and use of propane or natural gas and the matter of resale to the tenant.

f) Water system which involves local codes, a well system or municipal supply with reference to potable water and process water for condensers, and the matter of resale to the tenant.

g) Heating and cooling which may be considered as either individually or centrally heated shops or individually or centrally cooled shops. Or, a combined system for individually or centrally heated and air conditioned shops.

The engineering economics of the proposed mechanical systems pose the next questions. What type of systems will require the least initial capital investment? Which have the best amortization under present tax structures? What systems require the minimum of maintenance personnel? Which requires the least owner annual maintenance? Are individual tenant operated and maintained systems desirable, and can sales space so be leased?

Ascertain by observation of local merchants what percentage air condition their premises and note the quality and effectiveness of the systems used in the locality.

h) Lease agreements between the owner and tenants determine what pre-leasing requirements the owner and architect wish to incorporate for the unleased shell areas for the purpose of obtaining contracts. These requirements must be flexible enough for easy change to the tenant's requirements without changing the basic systems of the shopping center. What leasing agreements have been entered into between the realtor, owner, and tenant that affect the engineering design? What portion of the mechanical installations in the finished sales space will be done by the tenant and by the owner?

Articles to Follow

Subsequent articles will be devoted to the detailed description of several shopping centers of the local type. The mechanical designs for these centers were done by the author's staff.

Permission to publish this information has been granted by Samuel Brennwasser, design associate of the architectural firm of Sidney H. Morris & Associates, Chicago, who were the architects on the centers with which the author has been concerned.

New Color Code Marks Safety Hazards

. . . purple warns of radiation

SAFETY FOR THE man on the job is the purpose of the new American Standard Safety Color Code for Marking Physical Hazards and the Identification of Certain Equipment, which is the revision of a war standard. It uses three new colors to warn against potential danagers.

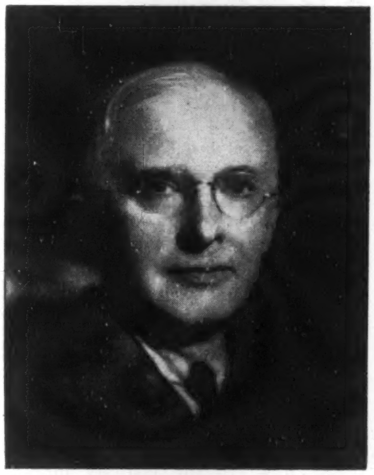
The recently-born radiation perils will be announced by high visibility purple. This color was adopted because the Atomic Energy Commission employs it in a broken-propeller-shaped symbol. The code suggests that purple be used in rooms and areas, indoors and outdoors, where radioactive materials are stored or handled. Burial grounds for this material and contaminated equipment are also marked by this color. Purple signal lights may be used to indicate when radiation-producing machines are in operation.

Two other colors added to the revised code are orange — to designate dangerous parts of machines or energized equipment that may cut, crush, mangle or otherwise injure, and to emphasize dangers from exposed or unguarded parts of machines — and blue — long used as a signal by railroads — to warn employees not to attempt to operate machines while down or under repair.

Still a part of the code are the long-used, nationally accepted red, for danger and fire; yellow, for caution and physical hazards, such as falling and tripping; black and white, for traffic, and green for safety equipment.

The new code Z53.1-1953, may be obtained from the American Standards Association, 70 E. 45th St., New York 17, for 50c a copy.

Of Smells and Smelling



SAMUEL R. LEWIS, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping and air conditioning problems. This month, he has a few words to say about odors as related to air conditioning.

ONE OF THE deprivations of civilized living appears to be — as far as humans are concerned — our increasing insensibility to odors, compared to the scent-sensibility of wild animals to detect and to interpret and to react. The lore of the hunter is laden with the necessity of being down-wind from the hunted. There is a reasonable belief that the sense of taste and the sense of smell are transmitted to our brains by the same nerves from the same taste-buds.

Whether the increased and increasing use of tobacco has a significant bearing on our ability to distinguish odors may be subject to argument.

There have been many attempts by engineers to find out more about our scent-sense, but there seem to have been but vague accomplishments. Committees appointed for this purpose seem to me largely to run around in circles.

My own observation is that relative humidity of the air has a potent effect on how much we smell — the word "smell" being interpretable in this case in two ways; namely, what we receive and what we give.

Experience in providing refrigerated cooling for hotel rooms has indicated its relatively easy accomplishment, as far as reducing the temperature of the air in a guest room on a warm night by individual recirculation of the air. The results haven't been too satisfactory, however, if no positive mechanical exhaust from the room is provided, in connection with dilution of the original air by a positive supply of outside air.

The hotel guest may well have burned tobacco and may have spilled the liquid from jovial bottles; the evidence remains in the morning, despite the comfortable temperature. We instruct the chambermaid to open the window wide, and to try to dilute the smells as she changes the bed linen — but the aroma clings to carpets and drapes. For this reason, one great hotel chain insists — after ample experience — on a positive supply of new air mechanically delivered from out-of-doors for diluting the odors in every air conditioned bedroom. The use of an "odor-sponge" of some kind to adsorb or destroy the odors from the air in artificially cooled rooms seems to be growing.

The traveler who passes through the cars of a modern railway train certainly becomes odor-conscious, even though when he stops over for a little time in any car, he rapidly becomes inured to its aroma and forgets it. Perhaps if nature or civilization had not bestowed upon us this tendency quickly to forget a disturbing smell, we would not be nearly as happy.

A research study by the American Society of Heating and Ventilating Engineers on the effect upon students of deficient dilution of room air with new air from out-of-doors indicates some loss by the subjects of their normal desire for food. Perhaps we should be thankful that odor-sense and taste-sense are akin. An unpleasant odor becomes masked after a little endurance and we keep on breathing the air and apparently suffer no immediate harm. Nature's wise provision seems to be that ultimately, unless we run away from the stink, we will not eat and may starve!

Uses Quick Method To Estimate Fuel Need

. . . for naval station

A FRIEND OF ours, Bob Ash — in the Navy during the war — found himself very much on the spot when the public works officer at a big naval training station ordered him to estimate the coal requirements for the coming year — and gave him three hours to produce the figure! What complicated the question was a twenty-fold increase in "population" at the station.

Our engineer friend obviously had no time to make a heat loss survey of the many buildings. So he took the previous year's coal consumption figure, multiplied it by 20, and told his superior that 150,000 tons of coal would be needed.

To the consternation of our friend, the captain issued his orders immediately for the coal — 150,000 tons of it — to be supplied to the station just as quickly as possible. All year — in the midst of all that coal — our friend had visions of a court martial.

But all's well that ends well. At the end of the year, it turned out that the coal consumption had totalled 138,000 tons. Not a bad engineering guess!

ANYTHING CAN HAPPEN

Mac Helps To Solve a Paper Mill Piping Problem

By Bill Dopp

• Almost anything can happen when you're in the engineering, operating, contracting or sales ends of the heating, piping and air conditioning industry. The objective of this more-or-less regular editorial feature in HPAC is to discuss practical problems that need solving — and ways to solve them.

Bill Dopp has had some 40 years of experience dealing with piping, including a long stretch of service as a sales engineer. He is devoting part of his present leisure to drawing on his many piping experiences.

This month, Mr. Dopp's principal character, Martin MacVane, helps some of his friends at a paper mill to clear up a problem involving the piping which was ruining production.

"GOOD MORNING, Miss Nelson," said Martin MacVane cheerily as he came into the shiny new office of the Willow Run Paper Co. "You certainly are all dolled up around here."

"Do you like it? We feel a bit new in it ourselves," declared the smiling receptionist. "I suppose you want to see Mr. Woodbridge. He's terribly busy. Some kind of trouble out in the mill," she said, as she picked up the phone headset. "Oh, here he comes now."

"Hello, Mac," Harry Woodbridge greeted the gasket salesman heartily, although a slight frown passed over his face. "How are you? Gosh, I'm sorry I'm not going to be able to see you today. We've got a conference on right away; when it'll be over I don't know. Might be all day." Obviously sincere, he still was trying to ease Mac out gently when Bill Howard came along.

"Hi, Mac." Bill greeted his old friend, shaking his hand vigorously. "Glad to see you."

"Nice to see both of you fellows. I suppose you're in this meeting too, Bill, so I'll be running along. I'll be by this way again soon." Mac shook hands and turned back to Miss Nelson as the two men left the room. "Looks like a busy bunch today," he remarked. "Well, I'll be seeing you soon."

"Good-by," she said, as he started for the door. "Wait!" she exclaimed. "Bill Howard wants to see you. He'll be here in a minute. Okay, Mr. Howard," she said into the phone, "Mr. MacVane will wait." In a moment, Bill was back. He grasped Mac's arm.

"Mac, would you sit in on this conference? We've got a problem we've been thrashing around for a week and we're getting nowhere. I think we've all got a blind spot on the thing and maybe you can see what it is we're overlooking. I've persuaded Harry to let me ask you in on it. Will you sit in with us?"

Mac was hesitant. He didn't know Harry Woodbridge, manager of the big mill, very well. Knowing nothing about the problem, he had the feeling that he'd be out of place. Still, he felt he couldn't turn down his friend Bill — who had given him many generous orders. So he reluctantly agreed. "All right, Bill," he said, "but I don't know that I can do you any good."

Soon Mac was seated at the table in the conference room. Harry Woodbridge sat at the head. All were in work clothes except Walter Simon, the chemist. There was a feeling of tension in the room. After the introductions were over, Harry said, "Bill, will you brief Mr. MacVane on our problem? That will give us all a chance to review the circumstances, too."

"Bugs in the Bond"

"Well, Mac," said Bill, "three times, now, in the last six months we have had a run of bad paper. You know we're justly proud of our high grade bond paper. It has a national reputation and we can't let anything happen to that. Every now and then we get a run that's all wrong — full of tiny black specks that Walter Simon, here, our chemist, tells us are amoeba. You know that they are microscopic one cell animals but when they get into our beautiful bond they show up like lighthouses. Literally, we have bugs in the bond. We haven't the slightest idea where they come from. All of our water is evaporated and, so far as we can determine, absolutely free of even slight mineral traces. Then these things show up and disrupt the whole place."

Mac listened attentively to the recital, his eyes noting the several nods as the story progressed. Walter Simon took up the tale from there. "Amoeba incubate in stagnant fresh water," he said, "usually in the presence of vegetable matter. There is no way that I can see that they can live in sterile water such as we use. Yet there they are. It took quite a while to identify them, but I'm certain that's what we have." He handed Mac a sheet of white paper with

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All of the names in this article are fictitious.

tiny black specks scattered over the entire surface. "The funny part of this is that, after a few days, they begin to disappear. Then we only get one or two at infrequent intervals. After a few weeks, they suddenly show up again in great numbers. Looks almost as if someone were committing sabotage."

"Hold it, Walter," Harry Woodbridge warned. "We've got enough trouble without introducing anything like that."

"Sorry," apologized the chemist. "I didn't mean to imply . . . "

"All right," interrupted Harry, "let's look at this thing again. How could the darn bugs get in? There's a hole in our system for sure. Where?" He looked around the table. "Certainly it must be after the bleaching. What do you think, Walter?"

"I think you're right, Harry; it comes in after the bleach. The thing that has me stumped is that we can't find any trace of these things until we get to the headbox. I've checked and checked. They don't get in during the washing — of that, I'm certain."

"They aren't coming from the filters or the evaporators," spoke up Jim Wallace, the plant engineer. "We've checked everything a dozen times. My opinion is that they are getting into the paper somewhere in the mill end."

"That's great," exclaimed Mike Stafford, the pulp department superintendent, "just great. Somewhere in the mill. Now, Jim, let's hear where." There was friction here, Mac saw. Harry looked annoyed but said nothing.

Mac broke the uncomfortable silence. "Do I understand that your paper runs perfectly for a time and, then suddenly these bugs appear?"

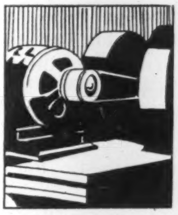
"That's right, Mac," answered Bill. "The darn things seem to come out of a clear sky."

Process Must Change

"Then something in your process changes," declared Mac emphatically. "Whenever any process runs along smoothly for a long time and then something goes haywire without any apparent reason — look for the change that has taken place. Something has changed here. What?"

Everyone looked at everyone else. Harry, speaking slowly, said, "Mr. MacVane is right, fellows; something changes here. It's only for a short period but there is something that changes. What is it? Put your beans to work; we've got to find out what happens."

"Waiting for a moment, Mac said, "Let's start at the beginning. I'll ask a few silly questions and you fellows set me straight when I get off the beam. First, I think we can eliminate the bleacher. Where does the pulp go from there?" He glanced around the table, noting that all eyes turned toward Mike. "All right, Mr. Stafford, you tell us," he said.



"To the washers," replied Mike. "From there it goes to the settling troughs. These are open but unless someone deliberately put something into them there is no chance of contamination there. Then to the mixer. Here the alum solution, the resin, sizing and color are added. I can't imagine anything like amoeba getting in here. Only evaporated water is used in the solutions and all are closed lines." Mike paused, shaking his head. "From there to the beaters, the beater chest, the jordans and the machine chest. Then to the headbox and onto the screens. I just can't think of a single place where anything could get into the process."

Mac had paid close attention to Mike's recital. "This is a continuous process, I take it?" he asked.

"Yes, Mac," replied Bill Howard. "We run twenty-four hours a day and seven days a week. Even at that, we're behind schedule. Things like these bugs really put us behind the eight ball." Bill got an uneasy laugh for that one.

"Don't you ever have to service any of these machines, Mike?" asked Mac.

"Oh, sure," replied Mike. "Every now and then we have a service job to do on the beaters or jordans. Sometimes a bleacher goes bad or gets plugged up and we have to take it apart or make repairs."

"Do you do that?" Mac suddenly seemed on the trail of something.

"No," said Mike, "That's up to Ted Weems — Ted and his maintenance gang. I've got enough to do without fixing machines."

"The maintenance department takes care of all of the equipment," explained Harry. "They keep things in mighty fine shape, too," he added, smiling at Ted.

How Are Machines Serviced?

"Tell me, Mr. Weems, just how do you go about servicing one of these machines — a jordan, for instance." Mac's question fixed all eyes on Ted, who acted a bit uncomfortable.

"Why, we just drain the machine and take it apart," began Ted.

"Let's have it in detail, Ted," directed Harry.

"All right."—He frowned thoughtfully — "When Mike reports a machine giving trouble, I take a couple of men and look it over. Mike tells me what he thinks is wrong. After listening to the way it runs, I usually agree with him. We cut it out of the run, closing all of the valves and opening the drains. Usually we wash it out with white water to save as much of the stuff as we can and finally clean it with cold water." Mac seemed about to interrupt here, but said instead, "Go on with the story."

"Then we pull the machine apart, clean up everything, repair the bearings — where the trouble usually is — and if the knives need attention we dress them and reset the whole thing for testing. We run it dry for a while to make sure everything is okay and put her back into service."

"Do you clean up the inside of the machine before you reassemble it?" asked Mac. The question brought an unexpected laugh from the whole group. They all waited for Ted's answer.

"In a paper mill, Mr. MacVane, cleanliness is above godliness. That is one of the most important things we have to watch. A little dirt or a few bugs like these can make a lot of trouble," he said pointing to the speckled sheets before them. "Every part is carefully cleaned before we put it back into place and then we wash the whole assembly with hot water before we start the test run." Pride rang through his answer.

"Where Do You Get Water?"

"Where do you get the hot water?" asked the inquisitive gasket salesman.

"From the floor service line," interjected Bill. "We have both hot and cold water on all of the floors. We use a lot of water around here."

"So I gather," responded Mac. "Have you had any machines out of service lately, Mr. Weems?" he asked Ted.

"Yes," Ted replied, with a curious hesitancy, "That No. 3 beater was out again a couple of weeks ago. The left hand bearing on that machine has given us no end of trouble. I've had to repair it for the third time in less than six months."

"When did you put that beater back into service?" asked Mac.

"Well, let's see. That was a week ago Monday, wasn't it, Mike?"

"No; we didn't cut that beater into service until last Wednesday," replied Mike. Everyone was ready for Mac's next question.

"And when did the bugs, as you call them, show up in the paper?" he inquired, smiling.

"On Thursday afternoon," almost shouted the entire group. "There's your trouble," remarked Jim Wallace, the engineer, with satisfaction.

"Not so fast, Jim," cautioned Harry Woodbridge. "We haven't solved this thing yet. The beater may be the place where they got into the system, all right, but where did they come from? That's what we have to find out." He looked inquiringly at Mac.

"If any of that last wash water remained in the beater, could these amoeba multiply in there in so short a time?" asked Mac, turning to Walter Simon, the chemist.

"They sure could — and how," the chemist replied. "They incubate fast, but there must have been some to start things off. Where did they come from?"

"From that wash water, I would say," opined Mac.

"Impossible," declared the engineer, too loudly. He was on the defensive but didn't seem to know why.

"You said that the water came from the service line, Bill. How hot was that water, Mr. Weems?" Everyone followed Mac's questions intently. He was on the trail of the trouble. Ted Weems got up.

"I don't know. I think I better get the fellow who finished with that machine in here. Wait a minute," he exclaimed as he left the room. The interruption relaxed the tension. Everyone got up for a stretch. Presently Ted came back, followed by a young fellow with a puzzled look on his face. "This is Joe Brown," he said to Mac as they all took seats. "Pull up a chair, Joe. Mr. MacVane wants to ask you some questions about that No. 3 beater."

Joe nodded as Mac turned to him. "When the beater was all together, you washed it out with hot water, didn't you?" he asked.

Joe thought a moment, considering his answer. Glancing at Ted Weems, his boss, he said, "Well, I guess it wasn't so hot. I only had a short hose so I put it on the other line. What's the matter?"

"What's the other line?" asked Mac quickly.

"That must be the domestic hot water line," declared Bill.

"That doesn't make any difference," exclaimed Jim Wallace. "I told you that all of the water we use in the mill is evaporated. That goes for the domestic hot water, too."

"How do you heat your domestic hot water, Mr. Wallace?" asked Mac.

Jim thought a moment. "We use steam coils in a closed heater," he said. "There's a thermostatic valve on the steam line. We keep the water at about a hundred and ten so that the fellows won't scald themselves in the showers."

"None of that water comes from city water mains, does it?" asked Mac. "Is there more than one source for the water you use?"

Drains Gathered in Hot Well

"Well. . . . " Jim didn't like this line of questioning. Harry was eyeing him shrewdly, "We use the return water from a lot of miscellaneous drains that are gathered into a closed hot well. There is a little pump that starts when the well gets to a certain height and puts the water into the heater. That is all pure water and perfectly clean, though it's not very hot. The whole system is a closed system. Nothing can get into it in the power house." The over-emphasis in his voice grated on the group.

"Is that hot well vented?" inquired Mac, in a sort of disinterested way.

"Yes," replied Jim indifferently.

"That lets air into it as well as vapor out. I'll bet a dollar to a doughnut that the hot well is the source of the trouble," declared Mac. "If that hot well had some stagnant water in it and the water is not hot enough to kill the bugs, then being closed and dark but partly full of air it should be a perfect breeding place for amoeba. Right, Mr. Simon?"

"Right," declared Walter, striking the table with his fist, "That would be a perfect incubator. I'm going to investigate that spot right away. Those bugs would do no harm in the domestic water but washing that beater with water loaded with amoeba would set off the very thing that has happened here. Boy, do I feel relieved. If this is the source of the bugs, and I'm pretty sure that it is, we can correct it quick. And we won't be using domestic water for washing equipment again either."

He turned to Jim Wallace. "It's not your fault, Jim," he said. "Those things could have been in there when the hot well was installed a couple of years ago, as Mr. MacVane suggested. A handful of stagnant water could have been the yeast that has kept going all this time — like the miner's sourdough yeast. It would keep right on infecting water until something like steam got in there to kill off the bugs. We'll look into that right after lunch," he said, as the meeting broke up.

The Trouble Discovered

Some time later, the group assembled again to hear what Walter and Jim had discovered. They gave close attention as Walter began. "We opened the hot well and took a sample of the water. It was about ninety degrees and looked perfectly clear until we got it into strong light. Under the microscope it looked like the zoo. Just loaded with amoeba. Mr. MacVane was right. That hot well turned out to be a perfect incubator and is no doubt the source of all of our trouble. When Jim gets through putting high pressure steam through it, there won't be any more bugs from that source."

Mac — wanting to head off any "demonstration" — said, "Sometimes an outsider can ask the foolish questions that bring to light facts that you who are close to a problem overlook. It's a wise engineer who knows what's going on in every pipe line in a plant like this. Things like this can sneak up on him unawares. That's when he needs a helping hand." He smiled at Jim Wallace as he got up to leave.

QUESTION OF THE MONTH

How Should an Iron Lung Be Air Conditioned?

- *IF YOU DON'T HAVE the answer to a heating, piping or air conditioning problem, chances are someone else does — or can be helpful on part of it. That's the reason for HPAC's Question of the Month "idea exchange."*
- *YOU ARE INVITED to contribute a question for publication, or an answer to a published question. Please address your reply to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*
- *RECENTLY, an air conditioning contractor asked the question, How do you air condition an "iron lung" in the treatment of polio cases? The question was sent to Dr. Philip Drinker of the department of industrial hygiene, Harvard University, who is also a member of HPAC's board of consulting and contributing editors, for reply since he invented the "iron lung." Dr. Drinker asked the manufacturer of the "iron lung" to answer the question. His reply is given here . . .*

IN REGARD to the question, How do you air condition an "iron lung" in the treatment of polio patients?, I think the best answer is to put it in an air conditioned room. Then the doctors and nurses can also benefit from the more comfortable environment.

Actually, the temperature and humidity in an iron lung approximate very closely the conditions of its surrounding atmosphere, because the iron lung is self-ventilating. In other words, each time the bellows goes down, it creates a partial vacuum in the chamber to make the patient inhale and at the same time it also draws in a certain amount of room air. On the upward stroke, this mixture of air in the bellows passes through the chamber and out an exhaust valve — the chamber reaching atmospheric pressure during this cycle. Thus, room air passes through the chamber some 15 or more times a minute.

About 20 years ago we provided our iron lung with thermometers until we learned there was no appreciable difference in temperature between the inside of the lung and the room. On one or two occasions we provided a respirator with an air cooling unit, consisting of a large container of ice with a recirculating fan, and occasionally I have thought of adapting a window air conditioner for this purpose. However, it seems more practical to air condition the room rather than the iron lung itself. Generally speaking, in my opinion, the temperature and humidity of an iron lung are no more uncomfortable than the same conditions surrounding a hospital bed.—WARREN E. COLLINS, JR., Warren E. Collins, Inc.

READER ASKS —

"Are School Heating Design Conditions Right?"

AS A RESULT of the increasing interest and importance in the big school building program, I have some questions which are related to the selection of heating equipment for new schools.

In the field of design standards, what ranges of air temperature, relative humidity, degree of radiant energy and air velocity will be most beneficial to the educational processes typical of contemporary classrooms, libraries, visual aids rooms, auditoriums, gymnasiums, swimming pools, cafeterias and related service corridors at the elementary, and high school age levels? It is my feeling that most of the published standards are aimed at bracketing comfort conditions for adults in business, occupational, residential or recreational environments and do not include standards for children in school buildings.

Since the outdoor temperatures during the 8 a.m. to 4 p.m. occupancy hours — typical of elementary schools — are usually much higher than the design dry bulb temperature in common use, could not economies in school construction be gained by a daytime occupancy design temperature?

Though it is traditional to depend on natural ventilation for mild and hot weather comfort in school buildings, it is my feeling that it should be possible with 3 to 4 tons of cooling capacity in a 900 sq ft, 30 pupil classroom of contemporary design to maintain an optimum educational environment without greatly increasing the initial cost of the structure, since these classrooms are now costing between $30,000 and $40,000 according to present day figures that are available. It is estimated that about 10 percent of this total cost goes to winter heating and ventilation. What would an estimate of the cooling load of a typical N, S, E, or W elevation classroom in St. Louis be? What would be its heating load during occupied classroom hours? What would be an estimate of the installed cost of an automatically controlled, carefully zoned heating and cooling system in a 10 classroom building with five rooms facing north and five south?

I have asked these questions of several in the field with a surprisingly wide spread in their answers. This variation suggests to me that a special study of this subject is needed. Any information on this subject which can be made available through HPAC's pages will be most appreciated.—R. W. MCKINLEY, Development Engineer, Pittsburgh Corning Corp.

[You are invited to comment on this question, giving actual examples if possible. Address the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2].

A.C. Contractor Wins Bid Decision

WILLIAM HURD HILLYER, author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. As a former vice president of the Atlanta Trust Co., his work there gave him a practical legal background.

THE COMBINATION of general contractor, subcontractor, consulting engineer and architect may lead to difficulties and end in the courts if bids do not strictly adhere — whether orally or in writing — to specifications well understood by all parties.

A public authority in one state advertised for bids covering the alteration and enlargement of its office building. E. Rekt & Co., general contractors with headquarters in another state, decided to bid on the entire undertaking. Following some preliminary correspondence, an engineering and contracting company, Konn-Dischning Inc. [all names are fictitious], whose headquarters were in the state where the work was to be done, wrote Rekt a letter on August 30th purporting to embody a "bid" worded substantially as follows:

". . . Wish to quote a price of $35,851.00 for . . . air conditioning and heating. We are using Such & Such equipment throughout, with the exception of the fan and coil sections. Those that we use will comply with the specifications. This bid is in accordance with specifications for alterations and additions likewise identified. We appreciate very much the opportunity of quoting, and if there are any questions concerning this bid, we will be glad to clarify them upon your request."

Contract Awarded Rekt

This letter, which arrived two days after Rekt put in his bid using its figures, confirmed a previous telephone conversation. Rekt was awarded the entire contract. In good humor, he went promptly to the site to begin work.

On September 3rd, he told Konn-Dischning that the governor had approved his general contract and when that dignitary should actually sign the papers covering the entire job "a formal order or contract" in respect to the air conditioning and heating would be sent to Konn. Meanwhile, the building's architect was furnished with a list of the subcontractors, whereon the pencil notation "35,800" appeared opposite Konn-Dischning's name.

E. Rekt & Co. wrote to Konn on September 16th advising him that his concern had been "approved as a subcontractor for air conditioning and heating for the subject job and . . . enclosing the original copy of the subcontract . . . which we have executed. If the subcontract is satisfactory to you, please complete the performance bond and return to us an executed copy of the contract and bond."

No "Acceptance in Terms"

Though this letter was apparently intended as an acceptance of Konn-Dischning's bid, there was no "acceptance in terms" — to borrow language used later by the court.

When September drew to a close and Rekt had received no word from the engineering firm, he wrote calling attention to his letter of the 16th and requested return of the subcontract duly signed. In the early part of October, the contractor and subcontractor met and had a talk, in the course of which the following difficulties came to light:

Konn-Dischning's letter of August 30th stated that they were using Such & Such equipment for air conditioning and heating. That equipment consisted of a high speed compressor motor instead of a low speed motor, as required by the specifications. It also consisted of a galvanized evaporative condenser — not one made of stainless steel as required by the specifications. The proposed subcontract, submitted with the September 16th letter for Konn-Dischning's execution, contained the requirement that "the subcontractor shall be bound by the terms of the original contract, insofar as the same may pertain to the work and materials embraced in the subcontract." Manifestly, this had the effect of eliminating Such & Such equipment.

Bid Disapproved

Things came to a climax when, on October 13th, Konn-Dischning wrote to Rekt that the architect had disapproved the bid because it was not based on the plans and specifications. Nor, said he, was it in accordance with instructions to the bidder on the matter of the condenser and the compressor motor. These non-conformities, we have noted, were discovered in the meeting that was held previously. Konn-Dischning therefore advised Rekt & Co. that, having misinterpreted the specifications so far as the condenser and compressor motor were concerned, they felt they should step aside and allow the subcontract to be awarded to some other bidder. In a word, they "had no alternative but to withdraw".

This was not pleasing to Rekt who, after a decent interval, replied that he had used Konn-Dischning's figures in preparing his own bid and consequently — he wrote — "you have an obligation to fulfill your contract with us."

Rekt & Co. proceeded to secure other bids. On the 20th of January they wrote Konn-Dischning that the best that they could get the work done for was $38,617.00. Rekt therefore requested from the air conditioning company the sum of $2-766.00, the difference between Konn-Dischning's figure and that of the substitute bidder.

No Meeting of the Minds

In circuit court, the general contractor — Rekt — obtained a judgment for the sum demanded, and the subcontractor — Konn-Dischning — appealed. The state supreme court, reversing the lower bench, recognized that the subcontractor offered to furnish a certain type of equipment but expressed in his bid the opinion that this equipment was in accordance with the specifications, but the bid was not in accordance with those specifications. Therefore, reasoned the court, E. Rekt & Co.'s "purported acceptance of bid" — which acceptance required that Konn-Dischning must comply with the specifications — was in effect a counter-proposal eliminating the equipment as offered in the bid. Lacking acceptance of such counter-proposal, "there was no meeting of minds".

From the high court's comments and rulings in this case, a number of instructive "dicta" emerge:

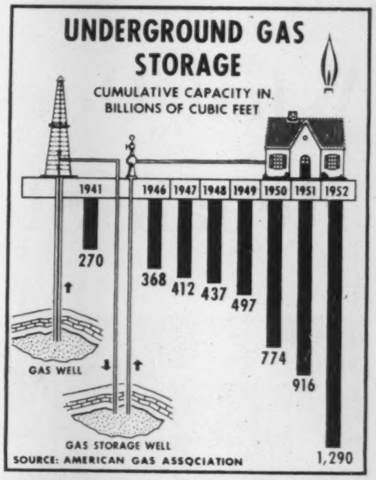
a) The minds of parties must meet as to all the essential features of a contract.

b) Assent of parties to a contract must be manifest from the language used.

c) A contract may consist of several communications between the parties, some in writing and some verbal. Each constitutes a link in the contractual chain, and every such communication is part of the contract.

[Note: While this discussion applies to an actual case, it should be remembered that legal rules vary in different states.]

Impressive Gains Seen for Gas Utilities, Pipe Lines



INCREASING NUMBERS of heating customers are being served as a result of extensive development of natural gas underground storage facilities in the U. S.

SALES OF GAS by utilities and pipe lines in 1956 will total about 71.6 billion therms, an increase of 33 percent over actual sales of 53.8 billion therms in 1952, and 25 percent higher than estimated sales of 57 billion therms in 1953. This forecast was published recently by the American Gas Association in a report on gas requirements and supplies of the gas utility and pipe line industry.

The report covers industry estimates on an annual basis through 1956 as well as forecasts of peak day requirements and supply through the 1956-1957 heating season.

Anticipated 1956 space heating demand will exceed 1952 requirements by approximately 55 percent. This is the largest relative gain foreseen in any class of service. Residential space heating customers are expected to number 16.1 million in 1956, an increase of 38 percent over the total served by the industry at the end of 1952.

The demand for gas for space heating is increasing more rapidly than the rate of customer growth. Acceptance of gas for space heating is growing rapidly in northern areas under the impetus of pipe line expansion programs. Generally speaking, southern areas now have a higher degree of space heating saturation. Residential space heating will account for 23 percent of total annual gas requirements in 1956, compared to less than 20 percent in 1952.

Sales to interruptible industrial customers are expected to increase only slightly as the gas industry utilizes underground storage facilities more extensively in meeting peak load requirements imposed by space heating demands. Total withdrawals of natural gas from underground storage in 1956 will approach 4.4 billion therms, representing a gain of 110 percent over total withdrawals in 1952.

The increased use of underground storage in aiding pipe lines to operate at high annual load factors perhaps is one of the most significant developments shown in the survey. More than one-third of the total increase in peak day availability of natural gas from the 1952-1953 season to the 1956-1957 heating season is attributable to increased withdrawals from underground storage.

Peak day requirements for residential space heating are expected to advance about 49.2 percent during the four years to total more than 205 million therms. Total peak day firm requirements for all sales and company use in the 1956-1957 heating season will be about 403.7 million therms while total supply as now estimated will be about 402.0 million therms. Concrete plans will be made, it is expected, to provide adequate supplies to meet the slight deficiency which appears only in the last year of the series.

The industry will require 7.3 million tons of steel pipe for its expansion program from 1953 through 1956. The major portion represents steel pipe of 16 in. and larger diameter, which will require 4.9 million tons or 67 percent of the total. Pipe of this size is used primarily by transmission companies to construct major lines.

New construction costs are expected to aggregate $4 billion in the four-year period with an estimated $1.9 billion being expended for transmission facilities. About $1.4 billion will be spent on new distribution facilities with the remainder going for production, underground storage and general plant expansion.

DATA SHEET

What Does It Cost To Repair Steam Traps?

REPAIR TIME can be saved if parts are stored like this

IT COSTS money to open and repair a trap. Therefore, it is actually cheaper — in many cases — to replace the mechanism, less bucket, at one time while the trap is open, than to open it for replacing the mechanism piece by piece, according to the Armstrong Machine Works, which has made the accompanying information available for publication.

Table 1 shows a possible indirect labor cost for opening and closing a steam trap. This will vary depending upon individual circumstances. Table 2 gives approximate direct labor costs for installing parts and assemblies. Table 3 summarizes Tables 1 and 2 and shows the savings effected by doing a thorough trap repair job. The $2.16 saving may seem trivial. But it is for only one trap; multiply it by 100 or 1000 traps and the figure demands attention.

The actual savings made by installing a seat, valve and lever assembly are by no means limited to the dollars and cents figure in this hypothetical case. If a new valve is used with an old seat, or vice versa, the joint may not be tight; the new part will not last nearly as long as though both parts were installed at the same time.

If the old lever is used with new valve parts, the life of the valve parts may be shortened.

Then, too, piece-meal replacement of parts will result in frequent work stoppages for trap repairs. The cost of work stoppages is not easy to evaluate. If only a one man crew is involved, there is a direct labor loss—to say nothing of production schedules.

TABLE 1—INDIRECT LABOR time and cost for opening a steam trap for repair and putting it back in service (assuming $2.00 an hour for labor)

Operation	Minutes	Cost
Get part from storeroom	3	
Get tools	2	
From storeroom to trap	5	
Shut off steam	1	
Blow down trap, or wait for it to cool	5	
Remove cap and mechanism	2	
Remove old gasket and clean gasket surface	2	
Apply gasket dope	1	
Put on new gasket	1	
Install cap with mechanism	2	
Turn on steam	1	
Back to shop	5	
Total	30	$1.00

TABLE 2—DIRECT LABOR time and cost for installing trap parts and assemblies

Operation	Minutes	Cost
A. Time for replacing valve, seat and lever assembly		
Unhook bucket	0.1	
Unhook lever assembly	0.1	
Remove guide pin assembly	1.0	
Remove valve seat	1.0	
Install new seat	1.0	
Replace guide pin assembly	1.0	
Install new lever assembly	0.1	
Replace bucket	0.1	
	4.4	$0.15
B. Time to replace valve seat only	4.4	0.15
(Operations are same as A above)		
C. Time to replace valve only		
Unlock bucket	0.1	
Remove lever	0.1	
Remove valve from lever	1.0	
Install new valve	1.0	
Replace lever assembly	0.1	
Replace bucket	0.1	
	2.4	0.08
D. Time to replace lever only	2.4	$0.08
(Operation same as C above)		

TABLE 3—SAVINGS effected by doing a thorough trap repair job

	Indirect labor	Direct labor	Material	Total
Cost of replacing seat only	$1.00	$0.15	$1.50	$2.65
Cost of replacing valve and retainer	1.00	0.08	1.50	2.58
Cost of replacing lever only	1.00	0.08	0.94	2.02
Total cost of individual replacement of parts	3.00	0.31	3.94	7.25
Cost of replacing seat, valve and lever assembly	1.00	0.15	3.94	5.09
Saving by doing complete job	$2.00	$0.16	-	$2.16

Heating, Piping & Air Conditioning

THE AMERICAN SOCIETY OF HEATING
AND VENTILATING ENGINEERS

JOURNAL SECTION

The object of the Society is to advance the arts and sciences of heating, ventilating, cooling and air conditioning, and the allied arts and sciences, for the benefit of the general public, to encourage and conduct scientific research, and to cooperate with other organizations having the same or similar objectives.

The Operating Cost of Residential Cooling Equipment

By S. F. Gilman*, L. A. Hall and E. P. Palmatier†, Syracuse, N. Y.**

ALTHOUGH satisfactory methods for predicting the operating cost of residential heating systems[1,2,3] have been available for several years, an authoritative method for predicting the cost of operation of residential cooling equipment does not yet exist. The rapidly increasing demand for residential air conditioning during the past few years makes it imperative that a method be developed which will gain acceptance by the air conditioning industry. With such a method, a potential customer could be given a reasonably accurate prediction of the monthly or seasonal cost of operating his contemplated equipment.

The objectives, therefore, of this investigation were:

SUMMARY — An investigation utilizing 11 normally occupied residences in six cities is reported. A method for predicting the operating cost of residential cooling equipment is developed and confirmed by test results. The analysis shows that operating cost can be related to degree-days above 70 F.

It is concluded that the method will ordinarily predict the seasonal operating cost to within ± 8 percent or $10.00, whichever is greater.

Charts for facilitating the practical application of the method are included and their use illustrated.

1. Development of a method for predicting the operating cost of residential cooling equipment.
2. Investigation of the validity and generality of the method by collecting and analyzing operating data from several residences in different parts of the country.

Derivation of Method

Over any period of time the power cost S of residential cooling equipment, expressed in dollars, can be predicted from the equation

$$S = RPT/100 \qquad \text{(1)}$$

where

R = power rate, cents per kilowatt hour.
P = power input to equipment, kilowatts.
T = predicted operating time of equipment, hours.

Paralleling the degree-day method of estimating heating costs, the hypothesis is made that the amount of heat removed from a residence during cooling is proportional to the number of degree-days above a datum temperature t_d. In equation form,

$$CT = KD \qquad \text{(2)}$$

where

C = total cooling capacity (sensible plus latent) of equipment, Btu per hour.
D = number of degree-days above the datum temperature t_d.
K = a constant of proportionality.

The value of D can be computed from available Weather Bureau data and the equation

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[1] Exponent numerals refer to References.

For presentation at the Semi-Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, Swampscott, Mass., June 1954.

JOURNAL SECTION

Table 1—Details of Residences Tested

Residence No.	City	Description	Floor Area, sq ft	Nominal Unit Capacity, Tons	Condensing Method	Cooling Load, Btu/hr	Load Factor*	Duration of Test
1	Atlanta	Tan Brick Ranch Style	2984	5	Cooling Tower	49,200	0.82	5/20 - 9/1/53
2	Atlanta	Brown and Grey Cape Cod	2450	2	Air	22,760	0.95	6/20 - 10/1/53
3	Washington	White Brick Virginian	1800	3	Waste Water	36,180	1.01	6/17 - 9/8/53
4	Washington	White Brick Garrison	2100	5	Cooling Tower	38,830	0.65	6/17 - 9/8/53
5	Houston	Red Brick Ranch Style	2424	3	Cooling Tower	38,000	1.05	7/9 - 7/22/53
6	Dallas	Tan Brick Ranch Style	1640	3	Cooling Tower	32,150	0.89	7/30 - 8/21/52
7	Dallas	Pink Brick Modified Ranch	3165	5	Cooling Tower	37,750	0.63	6/3 - 10/5/53
8	Dallas	Red Brick Ranch Style	2248	5	Cooling Tower	29,470	0.49	6/3 - 10/5/53
9	New Orleans	Red Brick Colonial	3365	3	Cooling Tower	34,000	0.94	7/12 - 8/13/52
10	New Orleans	Red Brick Colonial	3160	5	Cooling Tower	51,940	0.87	7/10 - 11/2/53
11	Syracuse	Green Ranch Style	967	2	Cooling Tower	21,400	0.89	6/19 - 9/1/53

*Ratio of cooling load to nominal unit capacity.

$$D = \sum_{i=1}^{n} (t_a - t_d)_i \quad \text{.....................(3)}$$

where

t_a = average outdoor dry-bulb temperature for each individual day, Fahrenheit.

t_d = temperature base for computing degree-days, Fahrenheit.

Therefore, D is evaluated by subtracting the datum temperature from the average temperature for each day and then summing up over the period under consideration. It is important to note that negative degree-days are not considered; hence, Equation 3 is restricted to the condition that $t_a \geq t_d$.

The constant of proportionality K can be evaluated from the conditions on a design day. On such a day, Equation 3 reduces to

$$D = t_m - t_d \quad \text{..................(4)}$$

where t_m is used to distinguish between the average temperature for any day, t_a, and that for a day on which the design outdoor conditions are fulfilled, t_m. It should be noted that t_m is the design outdoor dry-bulb temperature minus one-half the daily range and, as a consequence, is easily determined for most localities from available publications.[4,5] Furthermore, the amount of heat removed on a design day can be expressed as:

$$CT = 24\ H \quad \text{.....................(5)}$$

where H is the average hourly cooling load over the 24-hr period. Thus by substituting Equations 4 and 5 in Equation 2

$$K = (24\ H)/(t_m - t_d) \quad \text{..........(6)}$$

The generalized form of Equation 2 is therefore

$$CT = (24\ HD)/(t_m - t_d) \quad \text{........(7)}$$

or in terms of predicted operating hours,

$$T = [24\ HD]/[C(t_m - t_d)] \quad \text{....(8)}$$

The principal unknown in this equation is t_d. Once its value is determined, the operating time T can be readily calculated and used in Equation 1 to predict the power cost. Consequently, an important phase of this investigation concerned the evaluation of the datum temperature t_d.

It should be emphasized that the value of H to be used in Equation 8 is not the maximum instantaneous heat gain but the *average hourly cooling load over the 24 hr comprising the design day.* At least one cooling load calculation method which seeks to evaluate H has been reported.[6,7] Therefore, for at least this method, the symbol H can be interpreted as the *calculated cooling load.* There are undoubtedly other load calculation methods which also seek to evaluate H but which do not appear in the technical literature. For the purposes of this investigation, H has been determined by the method reported.[6]

Apparatus

Of the eleven residences used during this investigation, data were collected from two during the 1952 cooling season and from the remaining nine during the 1953 season. These residences, which were made available through the cooperation of the owners, were occupied in their usual manner except that the occupants were requested to keep all windows and outside doors normally closed and to maintain a thermostat setting between 72 F and 75 F. The locations of the residences and other pertinent details are given in Table 1. It should be noted that the floor areas range from 967 to 3365 sq ft and the calculated cooling loads range from 21,400 to 51,940 Btuh. Since three different condensing methods are also cited, the ten residences and air conditioning systems evidently have many dissimilarities. A view of Residence 7 is shown in Fig. 1.

A separate watthour meter installed in the air conditioning circuit measured the total power consumption. The number of hours of compressor operation were obtained with a timer wired into the compressor circuit. In addition, Residences 1 to 6, inclusive, and 9 were equipped with chart-type half-hour demand meters.

Additional instruments used during the calibration of each air conditioning unit were the following: revolution counter and stop watch, sling psychrometer, wattmeter, manometer and orifices, laboratory-type pressure gages, precision potentiometer and copper-constantan thermocouples.

Procedure

Before beginning the regular collection of operating data, each residence was visited by Research Department personnel and the air conditioning equipment calibrated. The purpose of the calibration was to

Fig. 1—View of Residence 7 (Dallas), looking north.

obtain a precise evaluation of the actual cooling capacity C and total power input P as a function of the outdoor wet-bulb or dry-bulb temperature, depending on the condensing method. Representative results for units equipped with cooling towers are presented in Fig. 2. For the waste water applications the capacity and power input were considered constant throughout the season.

While calibrating the 11 units, the orientation of each residence was determined and several photographs taken. In addition, the effects of shading due to trees, adjacent structures, etc., were noted, and a set of blueprints or sketches procured, together with construction details. With this information, the cooling load H was calculated* by the so-called *24-hr estimating method*.[6]

During the cooling season, readings of the watthour meters and timers were taken periodically by field personnel and forwarded to the Research Department in Syracuse. From these readings, the actual operating hours and total power consumption of each unit were obtained over periods of approximately one month's duration. In addition, for seven of the residences more detailed data were secured from the demand meter charts, one of which is illustrated in Fig. 3. In conjunction with weather data, the charts were used to determine the operating time and cooling capacity for each 24-hr period.

Weather data for each city were procured from *Local Climatological Data* sheets issued monthly by the U. S. Weather Bureau. These data were used to obtain appropriate values of daily average dry-bulb temperature t_a for use in Equation 3, and also to determine values of C and P from graphs typified by Fig. 2.

Data for evaluating the mean temperature, t_m, which is the design outdoor dry-bulb minus one-half the daily range, were obtained from available material.[4,5]

With the data collected over test periods of about one month's duration, t_d was evaluated from Equation 8. Since t_d also appears in the definition of D given by Equation 3, the solution was obtained by a trial-and-error procedure.

The data collected from the demand meters also made possible an analysis of the operating data from seven of the residences on a daily basis, as follows:

For any one day, Equation 3 reduces to

$$D = t_a - t_d \qquad (9)$$

and Equation 8 becomes

$$T = [24\,H\,(t_a - t_d)]/[C(t_m - t_d)] \qquad (10)$$

Solving for t_a,

$$t_a = t_d + (t_m - t_d)\,(TC/24\,H) \qquad (11)$$

Dividing by t_m, there is obtained

$$\frac{t_a}{t_m} = \frac{t_d}{t_m} + \left(1 - \frac{t_d}{t_m}\right)\frac{TC}{24H} \qquad (12)$$

which is dimensionless and therefore a generalized equation for cor-

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*Sample copies of the load calculation form can be secured upon request to the authors.

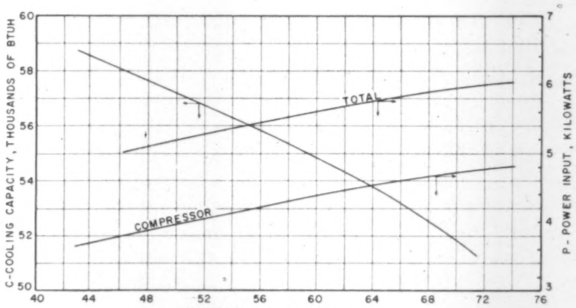

Fig. 2—Equipment calibration curves for Residence 1 (Atlanta)

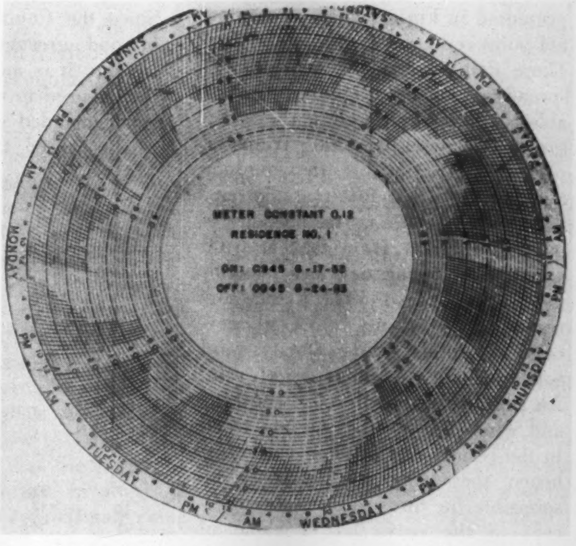

Fig. 3—Typical demand-meter chart from Residence 1 (Atlanta)

Table 2—Results of Datum Temperature Evaluations

Residence No.	From Daily Data		From Monthly Data	
	Test Period, days	t_d F	Test Period, days	t_d F
A	B	C	D	E
1	61	70.9	103	71.2
2	17	67.7	102	67.5
3	21	66.4	48	71.8
4	76	70.1	70	72.0
5	12	69.2	14	69.2
6	12	69.4	13	71.9
7	—	—	126	71.5
8	—	—	153	57.0
9	24	69.4	31	72.0
10	—	—	114	71.5
11	—	—	74	68.8

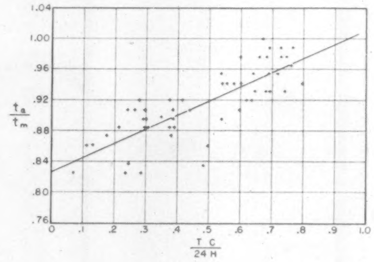

Fig. 4—Results of analysis of daily data from Residence 1 (Atlanta)

relating all data obtained on a daily basis. The form of the equation shows that t_a/t_m is a linear function of the variable $TC/24H$. Therefore, the data from each residence were plotted in the manner illustrated by Fig. 4, where the curve has been determined by the application of the method of least squares[8] to the plotted points. The intercept of the curve yields the value of t_d/t_m, from which t_d can be determined. To minimize heat carry-over effects, the period from 6:00 a.m. to 6:00 a.m. the next day was considered as a day when compiling the data. By this procedure, values of the datum temperature t_d were obtained from daily operating data gathered in seven of the eleven residences.

Results and Correlation

Representative results obtained from the daily operating data are presented in Fig. 4, where each plotted point represents a particular day. These daily data show considerable spread, which is partially attributable to thermal storage in the structure and contents resulting from the periodic variation of the outdoor temperature. The fact that the temperature at 6:00 a.m. on one day is usually different from that at 6:00 a.m. the following day also contributes to the spread. The points correspond to various values of percent sunshine, wind velocity, and some include the influence of rain. An analysis of the effects of sunshine and wind did not disclose any trend in the results due to these variables; hence, they were not primarily responsible for the scatter. The intercept of the curve has a value of 0.825, which when multiplied by the t_m value of 86 for Atlanta yields a datum temperature of 70.9 F.

The results for the 11 residences are presented in Table 2. The difference between the test periods in Column B and Column D is due to the fact that the analysis made on a daily basis permitted screening of the data and discarding those which were not valid. For example, if the occupants of a residence inadvertently turned the unit off before leaving for a week-end, the daily record would show this but the monthly record would not.

Comparison of the two datum temperatures obtained for seven of the residences shows close agreement with the exception of Residence 3, for which the Column C value is 5.4 deg lower than that in Column E. Re-examination of the test data did not disclose a reason for this apparent inconsistency in the results. Since the Column E value of t_d is in good agreement with others in that column, it is most probable that the period used to obtain the Column C value included some unknown effects which caused the inconsistency.

Another inconsistency exists in the value of t_d for Residence 8, because the value of 57.0 F is 13.7 deg below the 70.7 F weighted average for the remaining ten. Referring to Equation 8, this apparently erroneous value could result from the calculated cooling load H being less than the actual load. An analysis of the structure, air distribution system, and load estimating form[6] indicated the value of H was indeed too low. This residence had much of the supply-air ductwork in the attic and the return-air ductwork in a crawl space and, as a consequence, the duct heat gain was considerable. The load estimating form[6] is presently being refined to more accurately evaluate heat gains to ductwork in attics, basements, and crawl spaces, and thereby yield a more precise evaluation of H.

The results in Table 2 show that t_d varies somewhat from residence to residence. The cooling load of a residence is comprised of infiltration (or ventilation), transmission, solar, and internal components. When $t_a = t_d$, the net load over a

Table 3—Comparison of Actual and Predicted Operation

Residence No.	Duration of Test, days	Actual Operating Time, hr	Predicted Operating Time, hr	Deviation, Referred To Actual, Percent	Power Input, kw	Power Cost*		Difference, Dollars
						Actual	Predicted	
1	2	3	4	5	6	7	8	9
1	103	1270	1307	+ 2.9	5.95	$151.13	$155.33	$+ 4.20
2	102	1202	1107	− 8.0	2.35	56.49	51.96	− 4.53
3	48	437	479	+ 9.6	3.50	30.59	33.53	+ 2.94
4	70	436	476	+ 9.2	6.10	53.19	58.07	+ 4.88
5	14	294	278	− 5.4	4.70	27.64	26.14	− 1.50
6	13	292	264	− 9.6	4.50	26.28	23.76	− 2.52
7	126	1326	1403	+ 5.8	6.30	167.08	176.78	+ 9.70
8	153	1611	1285	−19.3	6.20	199.76	159.34	−40.40
9	31	388	346	−10.8	4.10	31.82	28.37	− 3.45
10	114	1253	1360	+ 8.5	6.66	166.90	181.15	+14.25
11	74	326	370	+13.5	2.93	19.10	21.68	+ 2.58

*Based on 2 cents per kwhr rate

24-hr period will be zero. Since the solar and internal components represent heat gains, the infiltration and transmission components must be heat losses. The datum temperature will therefore be lower than the room temperature. Since the relative magnitudes of these load components will vary from residence to residence, the datum temperature can also be expected to be a variable. However, the results in Table 2 show the variation in datum temperature is small. Consequently, it is concluded that t_d can be considered *constant* with sufficient accuracy for all practical purposes and, furthermore, *its value should be* 70 *F*.

A June 1948 study of the temperature conditions in several normally occupied residences has been reported.[9] When the residences were neither heated nor cooled, it was found that the daily mean indoor temperature remained 5 or 6 deg above the daily mean outdoor temperature over a range of weather conditions. Taking 75 F as the design indoor condition the predicted datum temperature would be 5 or 6 deg less, hence 69 or 70 F, which corroborates the conclusion drawn from this investigation.

As additional correlation, data secured from an ASHVE paper[10] reporting a 48-day test of a residence at the University of Illinois yielded 71.1 F for t_d. Since the test was conducted with no internal load, the datum temperature would be slightly higher than that for a normally occupied residence. Taking this into account, the value correlates well with the 70 F result obtained from this investigation. Moreover, in a report[11] of tests conducted in Kansas City, a tentative conclusion is drawn that the power consumption of residential cooling equipment is related to degree-days above 70 F.

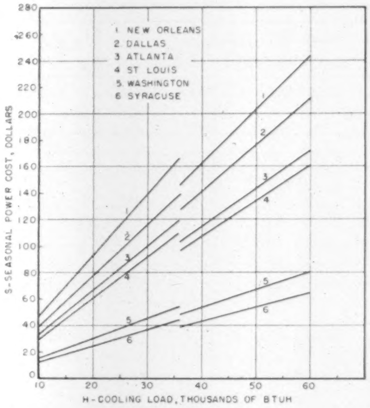

Fig. 5—Typical predicted power costs for six cities

For the 11 residences, the actual operating times and those which would be predicted on the basis of a 70 F datum temperature are given in Columns 3 and 4 of Table 3. Neglecting Residence 8, the results for which have previously been stated to be erroneous, the deviation between the actual and predicted hours of operation ranges from −10.8 to +13.5 percent, a rather low order of accuracy. However, the difference in dollars of power cost, Column 9, ranges only from −\$4.53 to +\$14.25 for the stated periods. Note that although the operating hours for Residence 11 deviate by 13.5 percent, the difference between the actual and predicted power cost is less than \$3.00 over a 10-week period. This residence is located in Syracuse, which has a short, cool summer. Hence, the operating hours predicted for northern regions of the country may be considerably in error, but the predicted dollars of power cost, which is of primary concern to the owner, may be within a few dollars of the actual.

The order of accuracy of the method when applied to various regions can be analyzed through inspection of Equations 3 and 8. In Equation 8, the larger t_m, the less is the error involved in T by accepting a single value of t_d, because deviations in t_d have less influence on the term $(t_m - t_d)$ when t_m is large. Recalling the definition of t_m; namely, design outdoor dry-bulb temperature minus one-half the daily range, better accuracy can evidently be expected in the hotter regions having small daily ranges. Examples would be New Orleans, Dallas, and Kansas City. Referring now to Equation 3, it is also evident that the larger t_a, the less is the error involved in D as a result of an approximate value of t_d being used. Therefore, the prediction of T should be most accurate in the regions of the country having long, hot summers.

On the basis of this analysis and the test results, it is concluded that acceptance of a single value of 70 F for t_d will ordinarily yield the predicted power cost for a normal cooling season within ±8 percent or \$10.00, whichever is greater. Such an order of accuracy is deemed to be satisfactory; indeed, greater accuracy can hardly be justified when it is realized that the year-to-year variation in the total number of degree-days accumulated will frequently be considerable. It must be recognized that for certain residences, especially those of unusual design, the accuracy of the prediction will sometimes be outside the stated range. If, however, the 24-hr average cooling load H is carefully evaluated, instances of poor accuracy predictions will be rare.

For regions of the country having a hot, dry climate, an analysis of the components comprising the cooling load indicates the optimum datum temperature may be a few degrees below 70 F. This results from the increased solar radiation which is characteristic of such a climate. Although it is believed the datum of 70 F is sufficiently accurate for these areas, correlation of operating data from hot, dry regions may be desirable.

With a value of 70 F for t_d in Equations 3 and 8, the seasonal power cost curves of Fig. 5 were predicted from Equation 1. The degree-days used in the computations were average values over a period of several years, and the power rate was that currently charged in the locality. The higher curve for New Orleans as compared with Dallas is primarily a result of the higher power rate in the former. The break in each curve at 36,000 Btuh cooling load is merely the result of the lesser kw/Btu requirement of this particular 5-ton unit.

The purpose of Fig. 5 is to provide an insight into the approximate power costs to be expected with units utilizing cooling towers. Since the curves are based on power input

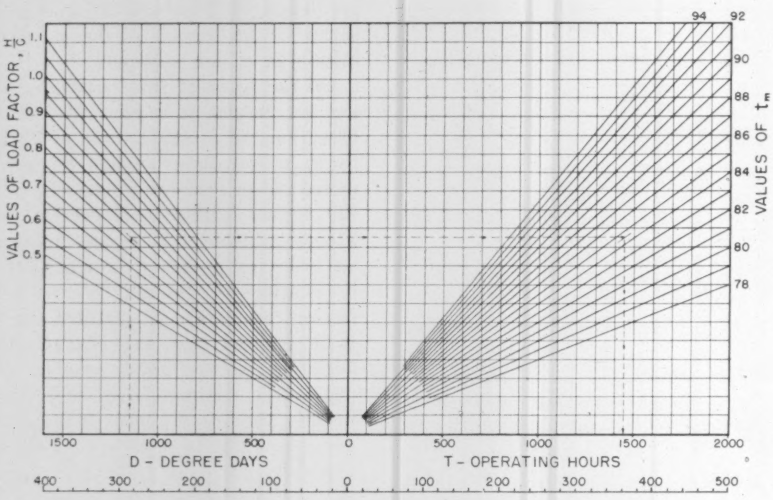

Fig. 6—Chart for predicting operating hours

and capacity data applicable to a particular manufacturer's equipment, they *must not be construed* as working curves for predicting power costs. Instead, the following procedure should be employed for each application of a manufacturer's equipment and for each type of installation; *i.e.*, air-cooled, cooling tower or waste water.

Practical Utilization of Method

To facilitate application of the method, the charts in Figs. 6 and 7 have been formulated. The first is used to predict the number of hours the equipment will operate and the second to obtain the resultant power cost. For convenience and greater accuracy in the low ranges, a second scale has been provided along the bottom of each chart.

The average capacity C and power input P over a month or season in a particular locality must be obtained from the equipment manufacturer. The 24-hr average cooling load at design conditions H should be obtained by the published method,[6] or an equivalent one. Tabulated degree-days above 70 F are not presently available in the literature, but it is hoped the U. S. Weather Bureau will begin listing daily values in the *Local Climatological Data* sheets which are issued monthly for numerous localities. For the present, values can be obtained from available degree-day maps.[12, 13] Alternatively, fairly accurate values can be readily procured from Weather Bureau data by subtracting 70 from the average monthly temperature and multiplying by the number of days in the month. By doing this for each summer month over a period of several years, values fairly representative of normal summer weather will be obtained. The hotter the weather, the better will be the agreement with the result of computations based on the daily average temperatures. It is recommended, however, that the TAC on Weather Data consider sponsoring a research project to secure more precise average values from weather data collected during the past several years.

The following example illustrates the use of the charts:

Given:

Total degree-days for season:	1150
Design dry-bulb temperature:	95 F
Daily range of dry-bulb:	21 F
24-hr average cooling load:	28,500 Btuh
Seasonal average capacity of equipment:	37,000 Btuh
Seasonal average power input:	4.5 kw
Power rate:	2 cents per kwhr

Solution: The load factor H/C is 28,500/37,000, or 0.77. Half of the daily range is 10.5 deg, which when subtracted from the design dry-bulb of 95 F yields 84.5 F for t_m. Then, from Fig. 6, 1450 is the number of predicted operating hours. Using this value of T in Fig. 7, the predicted power cost is $130.00. For an air condensing application this also represents the total operating cost. For a water condensing application the water cost, as determined from the operating hours, water rate and manufacturer's data on equipment water usage, is added to the power cost to obtain the predicted total operating cost.

Conclusions

The following conclusions were drawn from this investigation:

1. The operating cost of residential cooling equipment is proportional to degree-days above 70 F.

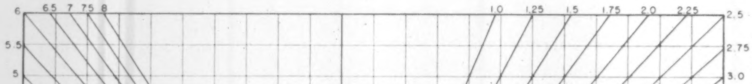

Fig. 7—Chart for predicting power cost

2. Since the procedure for calculating cooling degree-days is similar to that for calculating heating degree-days, the *degree-day* concept is preferable to the *degree-hour* concept frequently postulated for cooling.

3. Although both the analysis and test results indicate the datum temperature varies somewhat from residence to residence, for all practical purposes 70 F can be used irrespective of the residence and its location.

4. It is desirable that the Weather Bureau add cooling degree-days above 70 F to the *Local Climatological Data* pamphlets which presently list heating degree-days below 65 F.

5. The method which has been developed and validated will ordinarily enable prediction of the operating cost of residential cooling equipment during a normal season to within ± 8 percent or $10.00, whichever is greater.

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11. How Much Power Will an Air Conditioning System Use?, by A. D. Marston (ASHVE TRANSACTIONS, Vol. 43, 1937, pp. 269-86).
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Personals

VICTOR J. CUCCI, Consulting Engineer, announces the new location of his office at 411 — 55th St., Brooklyn 20, N. Y.

ERNEST T. SELIG, JR. has been appointed director of engineering (Boiler Division) at the Burnham Corp., Irvington, N. J.

He formerly was manager of Product Engineering Department (Heating Division) of the Richmond Radiator Co., New Castle, Dela.

C. M. ASHLEY a V-P OF *ASRE*

C. M. Ashley, ASHVE member since 1931 and chief staff engineer for Carrier Corp., Syracuse, N.Y., has been elected second vice president of the *American Society of Refrigerating Engineers.* In his new office, Mr. Ashley, in addition to serving on a number of committees, expects to visit chapters in the northeastern part of the country to deliver technical talks.

Mr. Ashley also served as *ASRE* treasurer during 1953, and since becoming a member has served as chairman of both the research and program committees, and a member of the executive committee and council.

Mr. Ashley, who has served on numerous ASHVE Technical Advisory Committees, is a past president of the Central New York Chapter of ASHVE. He is the author of a number of technical papers, some of which were published in the Society's JOURNAL and TRANSACTIONS.

ASHVE MEMBERS ON NEW *FHA* COMMITTEE

Frank Hudik, Society member since 1946 and a veteran in the air conditioning field, was named chairman of a new Air Conditioning Requirements Committee of the *Federal Housing Administration*, upon nomination of the *Refrigeration Trades Association* of Washington, D.C. Mr. Hudik is president of Comfortair Co., Hackensack, N. J. Two other ASHVE members are serving on the committee with Mr. Hudik. They are Frederick Boxall, president, The Bahnson Co., Winston-Salem, N.C., and J. L. Hoyer, consulting engineer of Washington, D.C.

Mr. Hudik, who is also vice president of the *New Jersey Association of Sheet Metal Contractors*, said that the committee was organized to establish standards for residential air conditioning for the *FHA*.

Obituary

LINN W. MILLIS
Kansas City, Mo.

The Society was very sorry to learn of the passing on February 1, 1954, of Linn W. Millis. Mr. Millis, who joined the Society in 1918, was made a Life Member in 1934. He was a Charter Member of the Kansas City Chapter and also one of its Life Members, and he served as Chapter president in 1926.

Mr. Millis was born on December 9, 1859, in Emporia, Kan. He began working as fireman and engineer in flour mills, saw mills and grain elevators. He received his drafting and shop experience with Great Western Manufacturing Co., Leavenworth, Kan., from 1881-1909. From 1909 to 1915 Mr. Millis was secretary-treasurer for the Prest Heating and Foundry Co. of Kansas City, Mo., and when that company was consolidated with the Security Stove and Manufacturing Co. he assumed charge of the heating department and was made secretary-treasurer of the Security Stove and Manufacturing Co. He served in this capacity until his retirement in 1946.

Mr. Millis is survived by a daughter, Mrs. Nellie Colby, Whitewater, Wis., to whom the Officers and Council extend their sympathy.

JOURNAL SECTION

1954 EDITION OF THE GUIDE

THE INCREASING value of the HEATING VENTILATING AIR CONDITIONING GUIDE will be evident from a review of the 32nd edition which is now available for distribution. Among the special features will be noted a new chapter on *Residential Summer Air Conditioning*, new data on methods of obtaining local relief in hot humid environments, new information on recent developments in air and gas cleaning, new tables on steam requirements of process equipment, and more detailed data on characteristics of pipe and tube.

Recent Society research has been used as a basis for extending the data on the effect of shading of glass and for improving the rewritten chapter on *Air Distribution*. The *Technical Data Section* has been enlarged to 1128 pages, representing an increase of 32 pages over the previous edition. The *Manufacturers Catalog Data Section* of 486 pages, illustrates the products of 319 well-known manufacturers. An Edge Index is a new feature enabling users of the Guide to open the book immediately at any desired chapter of text or any section of catalog data.

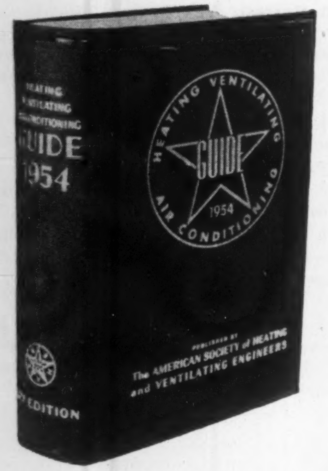
Many changes have been made in a large proportion of the chapters for the purpose of keeping the information up to date.

In the discussion of *Heating Load*, the procedure for selecting outdoor design temperatures has been rewritten for the sake of clarification, and the data on heat loss from floor slabs have been extended.

The section on oil fuel was improved in the chapter on *Fuels and Combustion*.

New information was added on draft requirements of appliances, operation of low chimneys, induced draft, and general considerations for chimneys in the chapter on *Chimneys and Draft Calculations*.

In the chapter on *Panel Heating*, illustrations, descriptions, nomenclature, and installation suggestions were revised on the basis of recent experiments in panel systems.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The AMERICAN SOCIETY of HEATING
and VENTILATING ENGINEERS
EDITION

The tables on dimensions and properties of pipe and tube in the chapter on *Pipe, Fittings, Welding* were enlarged to include more detailed information for design use.

Steam requirements of process equipment and of water heating equipment as determined by the *NDHA* were added to the chapter on *District Heating*.

In the chapter on *Air Cleaning*, the rewritten section on industrial air and gas cleaners includes information on selection, installation and operation of air and gas cleaners for industrial processes. New tables have been included to illustrate characteristics of industrial cleaners.

In the chapter on *Automatic Control*, which was largely rewritten to bring it up to date with recent progress, several types of controls were added.

New material was added describing types and features of various systems in the chapter on *Electric Heating*.

A general improvement will be noted in the chapter on *Owning and Operating Costs* which was rewritten for the purpose of indicating the present items to be considered in determining the cost of air conditioning.

The 52 chapters of THE GUIDE are grouped in sections as follows:

I — *FUNDAMENTALS*: Terminology, Abbreviations and Symbols, Thermodynamics, Fluid Flow, Heat Transfer; II — *HUMAN REACTIONS*: Physiological Principles, Air Conditioning in the Prevention and Treatment of Disease, Air Contaminants: III — *HEATING AND COOLING LOADS*: Heat Transmission Coefficients of Building Materials, Water Vapor and Condensation in Building Construction, Infiltration and Ventilation, Heating Load, Cooling Load; IV — *COMBUSTION AND CONSUMPTION OF FUELS*: Fuels and Combustion, Automatic Fuel Burning Equipment, Heating Boilers, Furnaces, Space Heaters, Chimneys and Draft Calculations, Estimating Fuel Consumption for Space Heating; V — *SYSTEMS AND EQUIPMENT*: Gravity Warm Air Systems, Forced Warm Air Systems, Steam Heating Systems, Hot Water Heating Systems, Radiators and Convectors, Panel Heating, Unit Heaters and Unit Ventilators, Unit Air Conditioners and Unit Air Coolers, Pipe, Fittings, Welding, Pipe Insulation, District Heating, Central Systems for Air Conditioning, Air Distribution, Air Duct Design, Fans, Air Cleaning, Spray Apparatus, Air Heating and Cooling Coils, Refrigeration, Dehumidification by Sorbent Materials, Automatic Control, Motors and Motor Controls, Sound Control, Electric Heating, Corrosion and Water Formed Deposits — Causes and Prevention, Owning and Operating Costs; VI — *SPECIAL SYSTEMS*: Industrial Air Conditioning, Industrial Exhaust Systems, Transportation Air Conditioning, Water Services, Residential Summer Air Conditioning; VII — *INSTRUMENTS AND CODES*: Instruments and Measurements, Codes and Standards.

The large 24 x 32 in. ASHVE Psychrometric Chart, printed in two colors, is included.

The 32nd edition was prepared by the following Guide Committee: W. S. Harris, *chairman*, P. R. Achenbach, R. E. Cherne, A. L. Hesselschwerdt, Jr., D. L. Mills, A. B. Newton, F. J. Nunlist, Jr., C. D. Shields, W. M. Wallace, II, R. S. Dill, *ex-officio*, and Carl H. Flink, *technical secretary*.

THE GUIDE is 6 x 9 in. in size, bound in blue cloth cover, stamped in gold, and is similar in appearance to previous editions. The price of single copies of this edition is $10.00.

JOURNAL SECTION

Field Studies of Floor Panel Control Systems[‡]— Part II

By A. B. Algren[*], E. F. Snyder, Jr.[**], and R. R. Head[†], Minneapolis, Minn.

This paper is the result of research sponsored by THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS in cooperation with the University of Minnesota, Minneapolis, Minn.

THE FIELD STUDIES on floor panel control systems have been in progress the past four years as part of the ASHVE research program on panel heating. This phase of the program has had the advisory guidance of *Group D* on Controls, of the Technical Advisory Committee on Panel Heating and Cooling.[††] The purpose of the studies was to determine from field investigation, the various factors affecting control stability and the ability of various control systems to overcome or assist these factors. The installations tested were in various types of building structures having varying percentages of glass area.

The criterion selected for the field studies was stability of controlled temperatures, since the effectiveness of a control system is primarily based on the conditions maintained. If control stability is attainable, it is then possible that those conditions necessary for comfort will likewise be attainable.

The results of two years of field studies, together with complete construction and instrumentation details were presented in a previous paper[‡].

SUMMARY — This paper discusses results of field tests covering various control systems in three different types of construction. It recommends specific practices in both the operation and type of control system and also brings out important factors in the design of a floor panel heating system. It further suggests that all practical data possible from field tests have been obtained and recommends further work of a laboratory nature where a controlled environment can be maintained.

The stability of a control point is not to be interpreted as meaning a constant temperature, but rather a temperature which may vary in some relation with load conditions. The principal factors constituting the load conditions are: (1) outdoor dry bulb temperature; (2) solar radiation; (3) wind; (4) building construction (glass area, infiltration, thermal transmission and heat storage capacity); and (5) occupancy.

To facilitate the field studies so that basic information could be obtained for early dissemination to the profession, the following three types of construction only were selected:

Type A Installation — Heavy floor panel, heavy building construction, large glass area. This *Type A* is a single-story general office in a factory building located in Milwaukee. Instrumentation of this installation was unchanged for the 1952-53 heating season.

Type B Installation — Heavy floor panel, light building construction, large glass area. *Type B* is the factory section for a second Milwaukee plant; the revised piping layout for this installation is shown in Fig. 1. The control systems furnished for the 1952-53 heating season were the same as for the 1951-52 heating season except for the variable locations of the outdoor temperature sensing bulb; in addition, a second boiler was added during the summer of 1952 to increase the plant heating capacity.

Type C Installation — Heavy floor panel, light building construction, small glass area. *Type C* is a residence located in Minneapolis. The control system of this installation for the 1951-52 heating season was on-off valve control and was changed to a proportioning three-way mixing valve control for the 1952-53 heating season. Fig. 2 gives a wiring diagram of the control system.

Testing Procedure

The test program for the 1952-53 heating season was specifically planned to consummate the floor panel studies. Certain changes in instrumentation were made for one or more of the following reasons: (1) To correct or improve design features of the heating system; (2) To increase the facilities for additional studies; and (3) To isolate control variables.

As no instrumentation changes were made at *Installation A*, the studies at this plant were essentially those of supplementing and verifying previous test results.

Individual test periods were reduced to four days for expedience of analysis, so that a maximum amount of necessary rechecking could be accomplished. The temperature trends from the desired portion of each strip chart were recorded in chart form.

Important Factors for Control of Systems

Various factors of primary importance in the control of floor panel heating systems were studied

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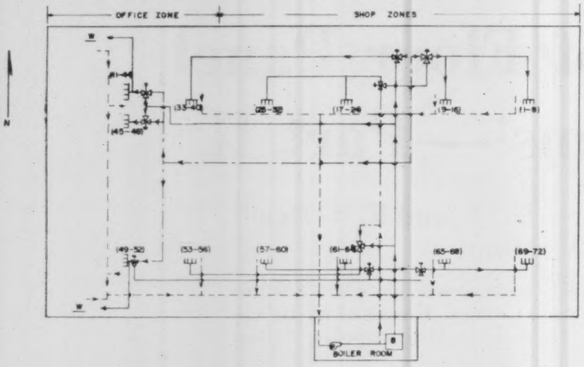
[‡] Field Studies of Floor Panel Control Systems, by A. B. Algren, E. F. Snyder, Jr., and J. S. Locke (ASHVE JOURNAL SECTION, *Heating Piping & Air Conditioning,* February 1953, p. 120).

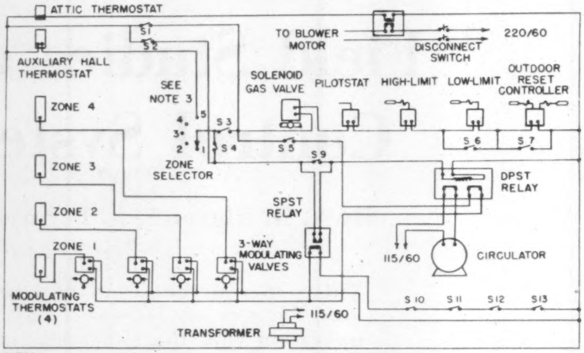
Presented at the 60th Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, Houston, Tex., January 1954.



Legend

Supply Water
Recirculated Water
Return Water
(1-72) — Stopcocks
B — Boiler
W — Wall Coils

Fig. 1—Panel layout for *Installation B*



NOTES:

1. SWITCHES S10-S13 ARE INSTALLED ON THE MOTOR SHAFTS OF THE MOTORIZED VALVES.
2. SWITCHES S1-S9 ARE OPERATED BY THE CONTROL-MADE SELECTOR SWITCHES.
3. TO OPERATE FROM HALL THERMOSTAT, TURN ZONE SELECTOR TO POSITION 5 AND SET MODULATING THERMOSTATS WAY DOWN. FOR VALVE CONTROL, SET ZONE SELECTOR ON POSITION 1.
4. MODULATING THERMOSTATS CAN BE USED ONLY WITH VALVE CONTROL.

ZONE 1 - DEN
2 - BEDROOM
3 - LIVING ROOM
4 - KITCHEN & UTILITY

Fig. 2—Schematic heating control circuit for *Installation C*

throughout the field test program. These factors, which are either peculiar to, or their effect more pronounced in floor panel heating systems, are listed in the order of discussion:

1. Rapid changes of heating load.
2. Thermal inertia of floor panel slab.
3. Use of solar compensator.
4. Location of outdoor temperature sensing bulb.
5. Common return water headers.
6. Thermal inertia of solar compensator.
7. Boiler water temperature control: (*a*) fixed; (*b*) reset.
8. Constant *vs.* variable heating load.
9. Exposed walls, effects on: (*a*) control; (*b*) temperature distribution; (*c*) air motion.
10. Floor covering.

Due to the inherent mass of the floor panel slab, the control problem associated with sudden heating load changes is of far greater consequence in a floor panel heating system than in any other type. The large thermal inertia of the floor panel slab precludes a rapid change in the energy level of the slab. Some outside weather conditions which effect a rapid change in heating load are sudden changes in: (1) the intensity of solar radiation; (2) the outside temperature; and (3) wind velocity, and/or direction.

The effect of a change in intensity of solar radiation on the space temperature is more pronounced in a construction where the walls that are exposed to the sun have large glass areas.

Use of Solar Compensator

A solar compensator, which had been previously developed for another use, was employed in conjunction with the control system which utilized reset boiler water temperatures. This control system permits adjustment of the boiler water temperature in accordance with the sensed outside temperature. To account for solar effects, inclusive with heating load, the outdoor temperature sensing bulb was located in the solar compensator.

The solar compensator consists of an insulated enclosure with glass in one side mounted in the same plane as the glass in the building. It is designed to take into account the immediate solar gain through the glass area of the walls and is oriented in the same direction as the heating zone it serves. Solar energy passing through the compensator glass impinges on a black plate in the compensator enclosure. This prevents outward reflection of the solar waves and results in an increase in the interior compensator temperature above the outdoor ambient temperature in proportion to the solar energy received. The outdoor temperature sensing bulb is located within the solar compensator back of the black plate and thus responds to the temperature in the solar compensator. The window area of the compensator is fitted with a shade so that its effective glass area can be adjusted in accordance with the amount of glass area in the building.

When the outside temperature sensing bulb is located in the solar compensator and there is an increase in solar intensity, the heating load decreases and the boiler water temperature would be adjusted downward. With either proportioning or on-off valve operation the thermal energy supplied to the panel would be decreased. However, because of the thermal inertia of the panel slab the rate of heat supplied to the space is greater than the heat loss. The space temperature rises until equilibrium is reached. This same inertia effect exists in reverse when a rapid increase occurs in the heating load due to a decrease in solar intensity. Both conditions are shown for *Installation B*, in Fig. 3, for the period from 8:00 a.m. to 4:00 p.m., Feb. 4, 1953. With the sudden increase in solar intensity, the energy to the panel was reduced sharply, as may be seen by observing the boiler and panel water temperature, although, the space temperature increased while the reverse condition occurred when the solar intensity decreased.

The space temperature varies more under the same load conditions if the outdoor temperature sensing bulb is not located in solar compensator but is shielded from the sun so as to sense only the dry bulb temperature. In this case the boiler water temperature is adjusted only in accord-

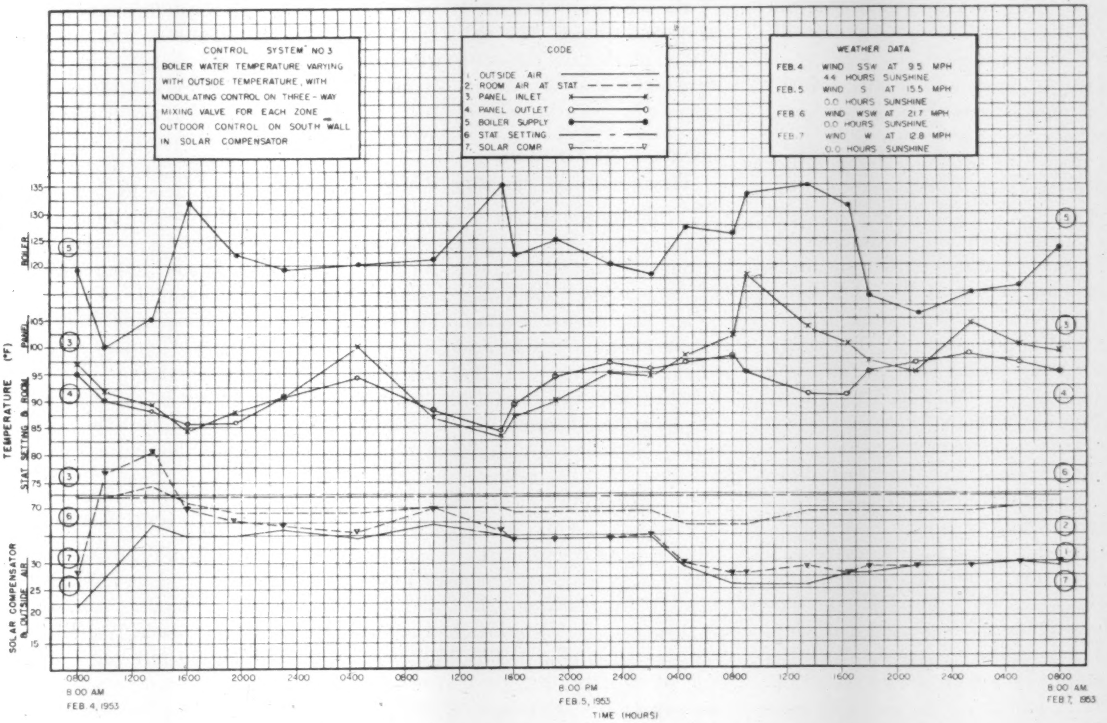


Fig. 3—Temperature trends for *Installation B,* 8 a.m. February 4 to 8 a.m. February 7, 1953

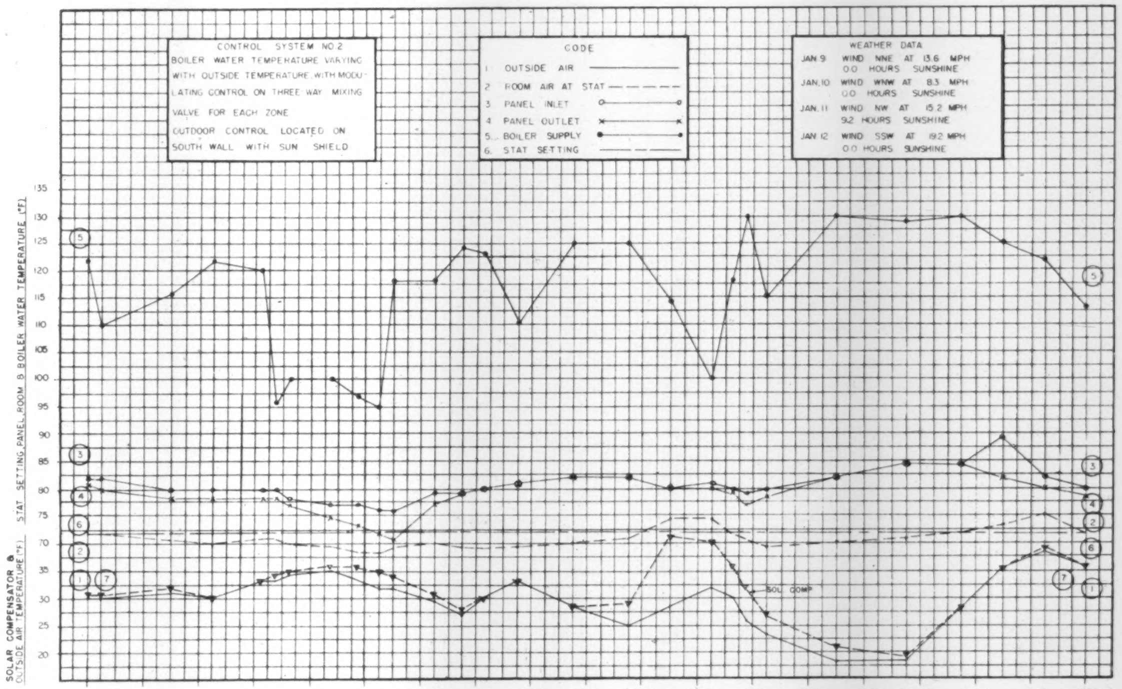


Fig. 4—Temperature trends for *Installation B,* 6 p.m. January 9 to 6 p.m. January 12, 1953

ance with the dry bulb and does not sense the solar effect which immediately reduces the heating load.

Fig. 4 shows test results for the same installation, and for the same control system as shown in Fig. 3, but with the outdoor temperature sensing bulb in a different location. In Fig. 4, the period between 9:00 a.m. and 6:00 p.m., January 11, 1953, is comparable to the previously mentioned period of Fig. 3 in heating load, though the increase in heating load is not as sharp. The boiler water temperature was not adjusted downward to the same extent as previously discussed; consequently, the space temperature showed a greater increase and remained above the space thermostat setting for a longer period of time.

In addition, in Fig. 4, there is a period from 5:00 a.m. to 3:00 p.m. January 12, 1953, in which the outside temperature increased markedly, and no sunshine occurred. With the reduced heat supply to the panel, the thermal inertia of the slab increased the space temperature from 71 F to 75 F. The sudden decrease in space temperature from 75 F to 72 F is due to the fact that the clerestory windows were open and the 24 in. diameter exhaust fan was turned on.

Location of Outdoor Temperature Sensing Bulb

Excluding the use of a solar compensator, a problem common to all systems of control is that of location of the outdoor temperature sensing bulb. The considerations involved in determining the location for optimum effects are: (1) type of construction involved in the installation; (2) location on sunny side or shaded side of installations, shielded or unshielded; and (3) location and ability to sense prevailing winds.

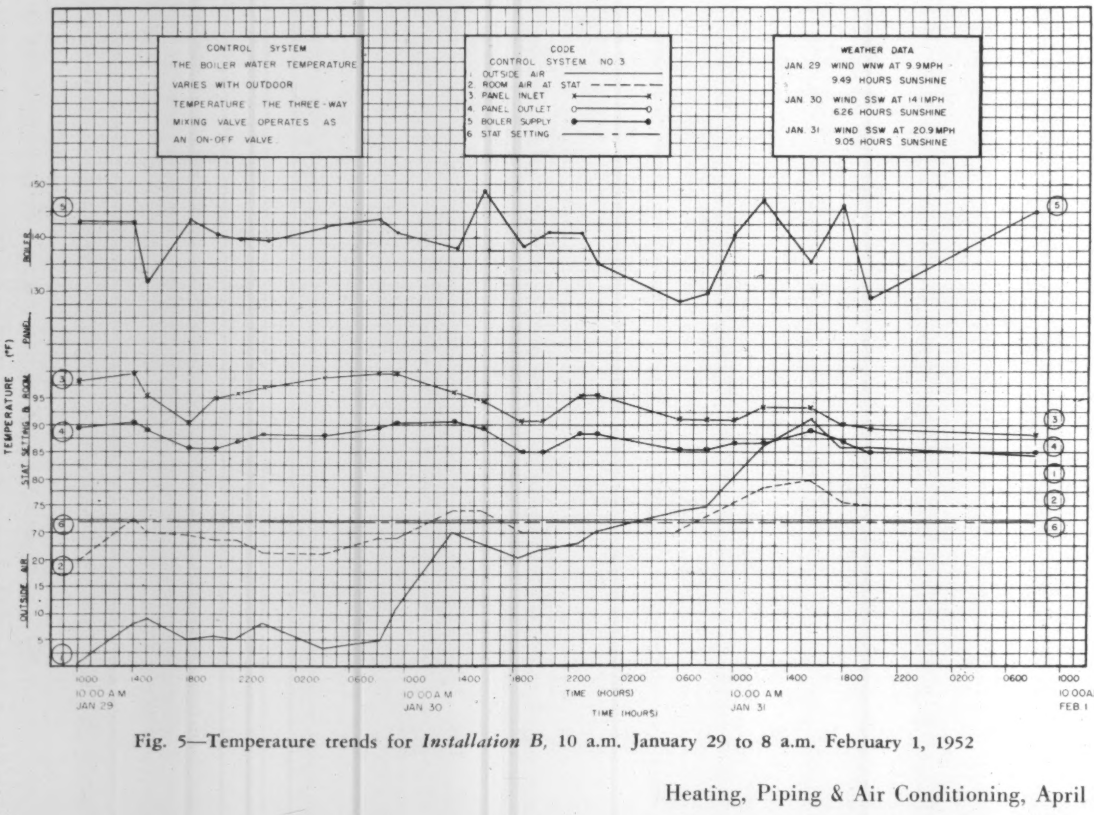
The location is particularly important for any installation which includes large glass area exposed to the sun, as in *Installation B.*

Location for the 1951-52 *Heating Season*: Through the 1951-1952 heating season, the outside temperature sensing bulb was located on the west side of the boiler room, and was thus unable to sense the early solar effects. Therefore, energy was supplied to the panel longer than was necessary. The result of this was the overheating of the interior space with complaints from the occupants.

An example of this condition of overheating due to lack of proper sensing of the solar effect is shown in Fig. 5, which represents the period from 10:00 a.m. January 29, to 10:00 a.m. February 1, 1952. Observe especially the period from 8:00 a.m. to 3:00 p.m. January 31, 1952, in which the increasing outside temperature together with the solar effect caused a considerable part of the space temperature increase from 70 F to 80 F.

Common Return Water Headers

A control problem in general will result from connecting the water returns of the separate zones to a common return header. It is seen that for the period referred to in Fig. 5 a temperature drop occurs through the panel even though only return water is being circulated. This is due to



CONTROL SYSTEM
THE BOILER WATER TEMPERATURE VARIES WITH OUTDOOR TEMPERATURE. THE THREE-WAY MIXING VALVE OPERATES AS AN ON-OFF VALVE.

WEATHER DATA
JAN. 29 WIND WNW AT 9.9 MPH
9.49 HOURS SUNSHINE
JAN. 30 WIND SSW AT 14.1 MPH
6.26 HOURS SUNSHINE
JAN. 31 WIND SSW AT 20.9 MPH
9.05 HOURS SUNSHINE

Fig. 5—Temperature trends for *Installation B,* 10 a.m. January 29 to 8 a.m. February 1, 1952

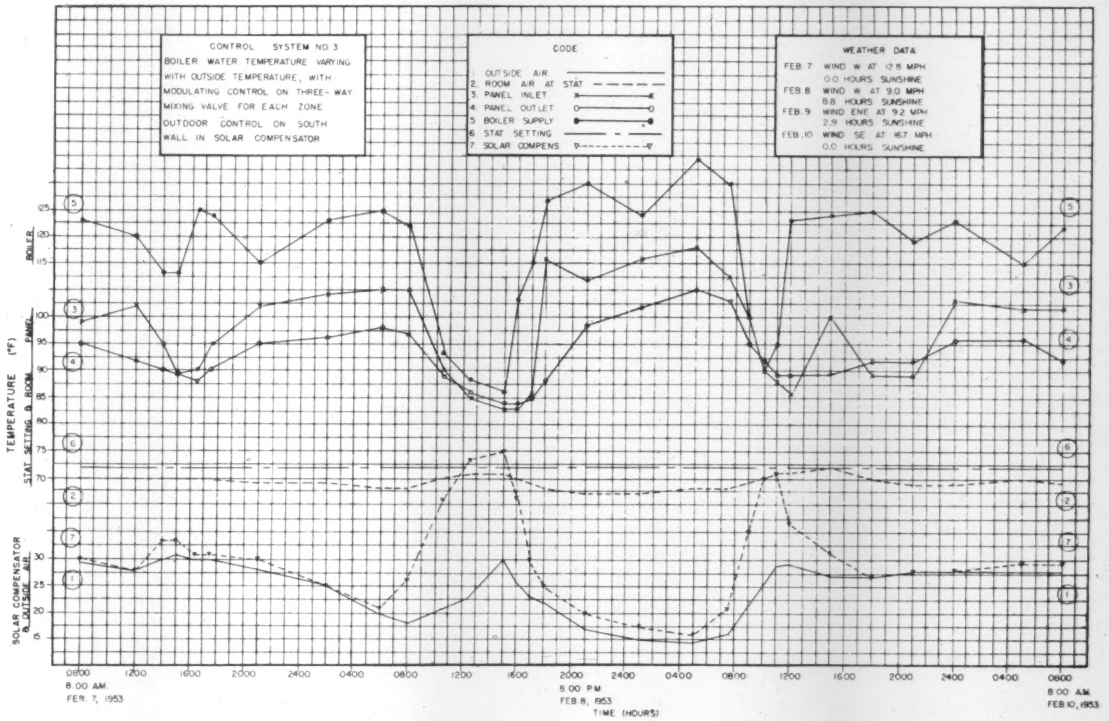


Fig. 6—Temperature trends for *Installation B,* 8 a.m. February 7 to 8 a.m. February 10, 1952

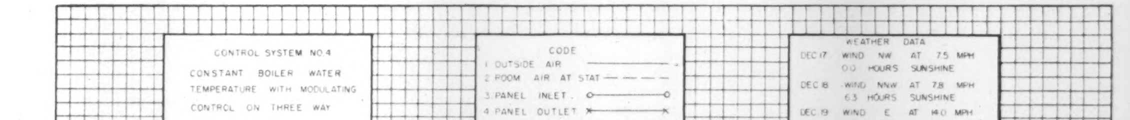


Fig. 7—Temperature trends for *Installation B,* 4 p.m. December 17 to 3 p.m. December 20, 1952

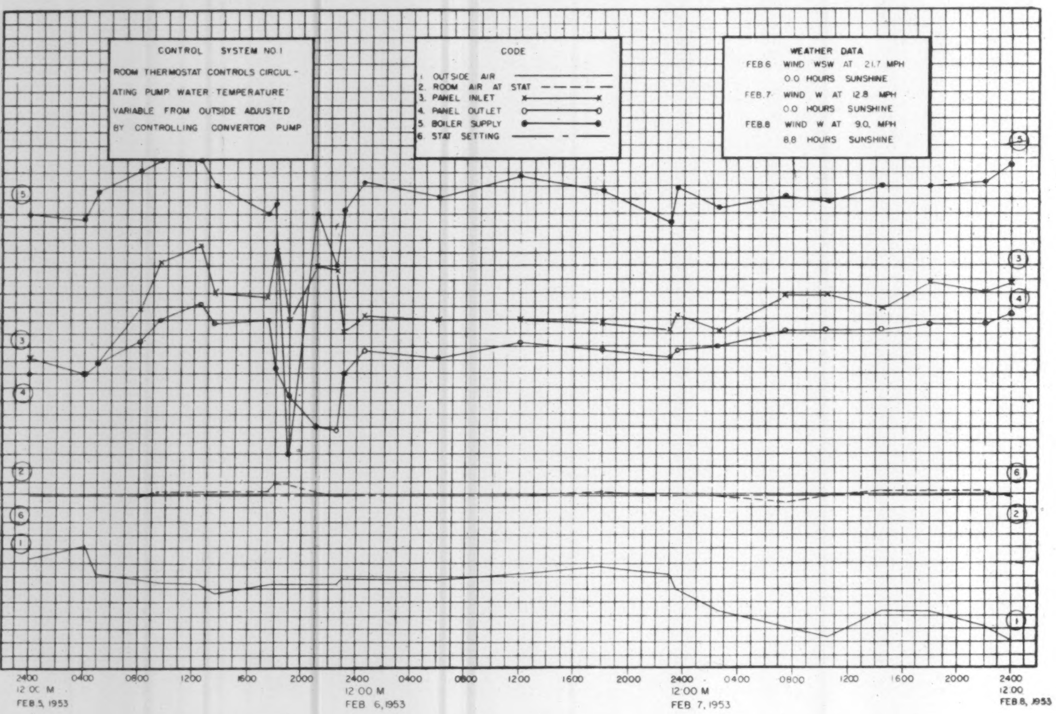


Fig. 8—Temperature trends for *Installation A,* February 5 through February 7, 1953

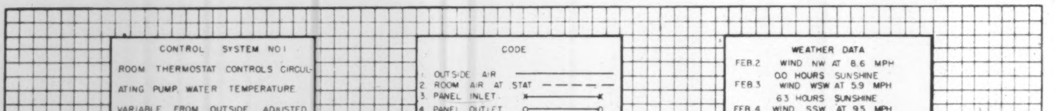


Fig. 9—Temperature trends for *Installation A,* 4 p.m. February 2 to 4 p.m. February 5, 1953

the fact that a common return header was used for all zone heating coils, and the return water from a zone calling for heat was at a higher temperature than the water temperature requirements of the zone represented in Fig. 5. This accounts in large part for the marked overheating.

During the 1952-1953 heating season for the *Installation B* two separate control systems were employed, and for each control system, the outdoor temperature sensing bulb was placed in several locations for the various testing periods. The predetermined schedule of changing control systems and the lack of proximity of the engineer supervising the control changes did not permit continuous scrutiny of the weather.

In subsequent evaluation of the strip charts, it was found that solar conditions were not identical and did not provide a complete comparison of the two control systems. However, the advantage of locating the outdoor temperature sensing bulb to detect the solar effect can be seen by comparing the period of Fig. 5, in which the outdoor temperature sensing bulb was located on the west wall, with that period of Fig. 4, discussed in the foregoing, in which the outdoor temperature sensing bulb was located on the south wall of *Installation B*.

Thermal Inertia of Solar Compensator

When there was no sunshine, the temperature in the solar compensator should have been the same as the outside temperature. Solar compensator temperatures in Figs. 3, 4 and 6 show that this was not always the case. Apparently the thermal inertia of the compensator accounts in great part for the difference when the solar intensity is decreasing. Since the glass area of the solar compensator is exposed directly to the sun, no thermal lag is evident for an increasing solar intensity. A review of the charts will show that a difference occurs immediately after the solar effect ceases.

Fig. 6 is more representative of the response of the boiler water temperature to the solar effect when the outside temperature sensing device is located in the solar compensator. A drastic drop in the boiler water temperature and the panel temperatures as the solar intensity increases can be seen in Fig. 6 by noting the periods from 8:00 a.m. to 4:00 p.m., February 8, and 8:00 a.m. to 12:00 noon, February 9. The space temperature, as a result, experienced a much smaller increase than if the outside temperature sensing bulb had been located outside the solar compensator and shielded from the sun.

Boiler Water Temperature Control

Fig. 7 represents a three-day period of operation with the same control system shown in Fig. 6, except that the boiler water temperature was held constant. The downward adjustment of the boiler water temperature and the panel temperature with an increasing outside temperature is clearly seen in Fig. 6, for the periods previously discussed. A similar outside temperature increase for the period between 8:00 a.m. and 2:30 p.m. December 18 is shown in Fig. 7. It is observed that prior to this period a steadily increasing load demand was imposed on the boiler and that the temperature of the water in passing through the boiler never reached the boiler setting temperature. As the outside temperature started upward, the load demand on the boiler was decreased and the boiler water temperature quickly reached the boiler temperature setting. Likewise, it is seen that the panel temperature increased. The space temperature increased 5 deg two hours before the peak outside temperature occurred, and was prevented from additional increase by the opening of the clerestory windows and the starting of the exhaust fan.

The extent to which a given control system can maintain a set temperature in a given enclosed space depends on many factors. Normally, the largest single factor is that of the type of weather load condition against which the control system is operating. For purposes of discussion, load conditions will be roughly classified according to outside dry bulb temperatures as follows: (1) mild — above + 40 F; (2) medium — + 10 F to + 40 F; (3) severe — below + 10 F.

Constant *vs.* Variable Heating Load

For any constant load condition, provided the heating plant is of sufficient capacity, the space temperature can be maintained fairly constant at the set temperature. This is almost entirely dependent on the sensitivity of the thermostat. The ability of a control system to maintain a constant space temperature for a constant load condition is seen in Fig. 8. For the first two days of this period, the outside temperature was essentially constant at about 33 F, while the space temperature remained essentially at 72 F.

Fig. 8 can be compared with Fig. 9, for which the same control system was employed for a variable outside load temperature, in which the minimum was 6 F and the maximum was 40 F. Figs. 4 and 7 (*Installation B*) also represent a comparison for relatively constant and variable outside load conditions as do Figs. 10 and 11 (Zone 1 of Minneapolis installation).

From these three comparisons it can be seen that the space temperature is most erratic when the outside temperature is varying rapidly.

The term MRT is defined for this paper as the mean radiant temperature of the inside surfaces of the building, and more specifically is the weighted average temperature of the heated and unheated surfaces. The MRT felt by the individual would depend on his position with respect to the inside surfaces and would increase as the individual moved inward from the exposed walls, as the floor surface would be essentially constant throughout the building. The direct radiant effect of panel heating in regard to the space temperature increases with an increase in the ratio volume/exposed wall area, or the less the exposed wall area, the less difficult becomes the problem of maintaining a set space temperature.

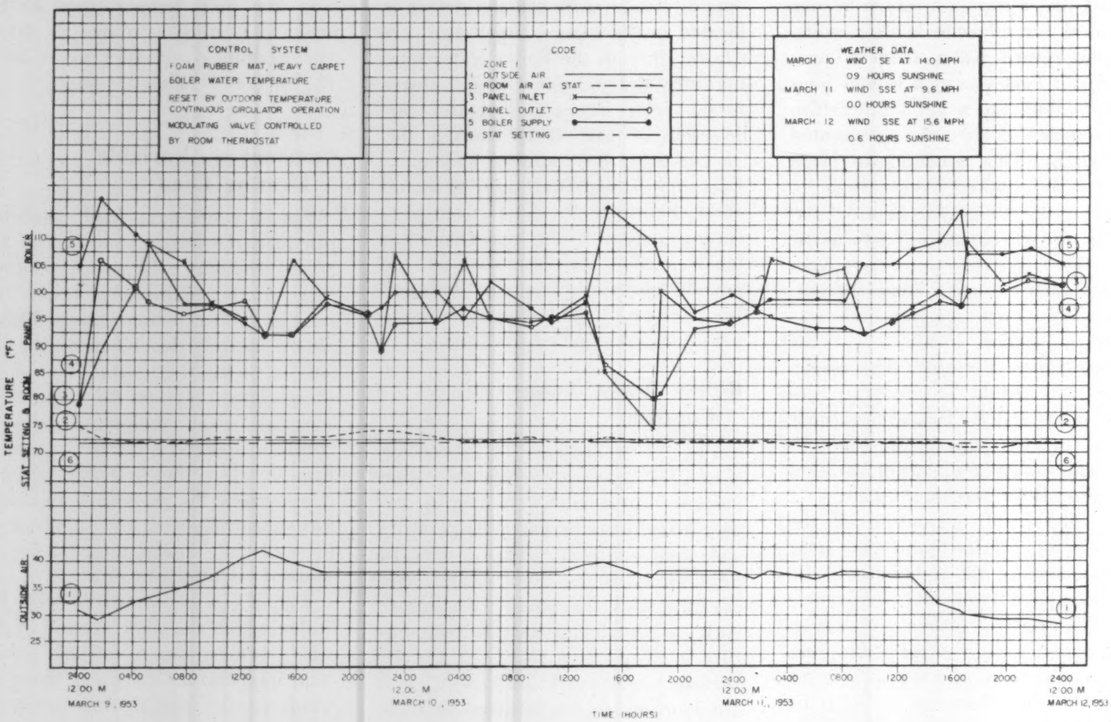


Fig. 10—Temperature trends for *Installation C* — Zone 1, March 9 through March 11, 1953

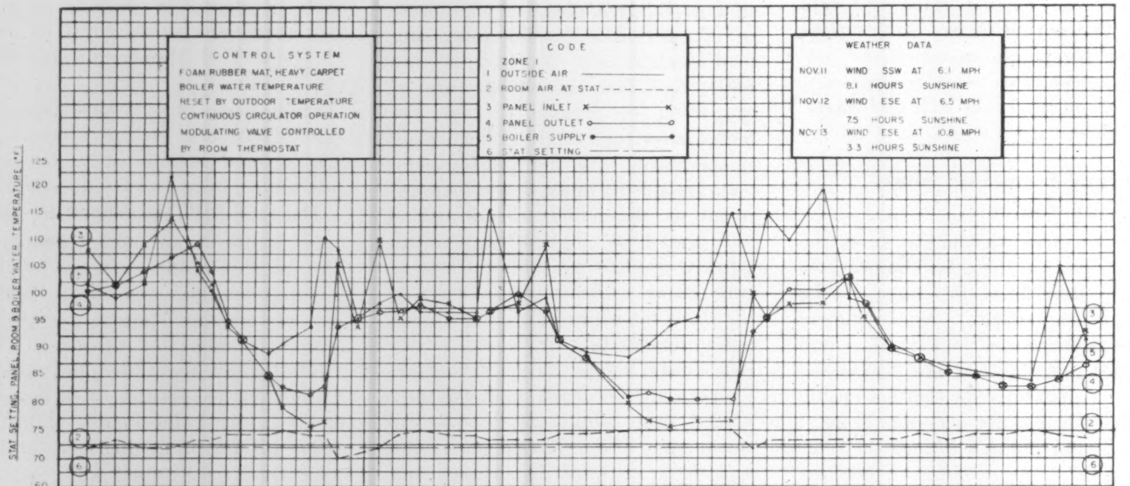


Fig. 11— Temperature trends for *Installation C* — Zone 1, November 10 through November 12, 1952

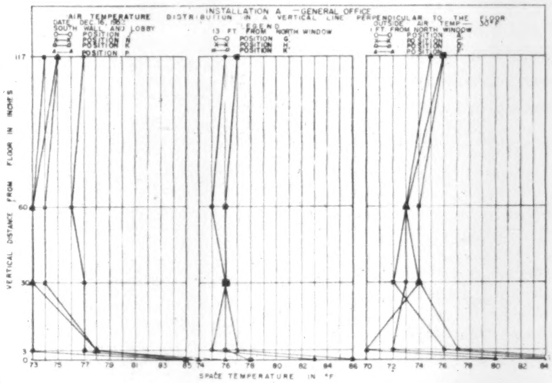


Fig. 12—Air temperature distribution in a vertical line perpendicular to the floor for *Installation A* — General office.

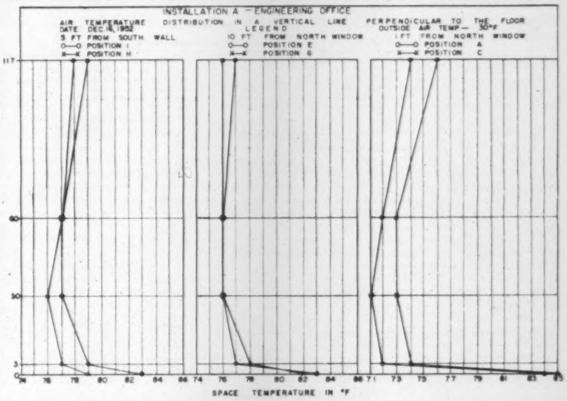


Fig. 13—Air temperature distribution in a vertical line perpendicular to the floor for *Installation A* — Engineering office.

Effects of Exposed Walls

In view of the fact that the exposed walls and windows have a direct influence on the temperature distribution and that the room thermostat is confined to sensing temperature at only its location, studies were made at each of the three installations to determine air temperature distribution in the space and air flow patterns around the exposed windows. Air velocities along the exposed windows were obtained with a hot wire anemometer. The profile of these velocities was obtained by smoke observation.

Air Temperature Distribution: Air temperature distribution was obtained by fixed and shielded thermocouples located on a portable stand.

Figs. 12 and 13 show vertical temperature distribution at various positions in the General Office and Engineering Office, respectively, of *Installation A*. It is noted that at each position the air temperature is higher 3 in. above the floor and 3 in. below the ceiling (117 in. level) than at intermediate levels. This is due to the convective effect on the air by the warm surface of the floor and ceiling. The intervening space between the floor and ceiling, which is not affected by localized convection, shows a very even vertical temperature distribution.

The short distance between the exposed window and the inside partition precluded the study at *Installation A* of the offsetting effect of the heated floor on the down draft as a function of distance from the window. However, this factor was studied at *Installation B* by taking air temperatures at various distances from the window at specific levels. Fig. 14 shows the effectiveness of the heated floor in heating the air moving downward and inward in a plane perpendicular to the window. The temperature distribution vertically may be observed at specific levels as indicated by Fig. 14.

Air Motion: The rate of air temperature change at the various levels tested is greatest at the 3 in. level and becomes progressively less at the 30 in., 96 in., and 60 in. levels as the distance from the outside wall is increased up to approximately 6 in. Beyond this point the rates of change for the 60 in. and 96 in. levels reverse and become equal at approximately 18 in. from the outside wall. This change in rate is due primarily to the convection effect of a non-uniform environment.

The main body of the air stream moving downward from the window makes contact with the floor at a distance greater than 1 ft from the wall; hence, the dotted portion of the curve for the 3 in. level is estimated.

Air temperature distribution in most rooms of the Minneapolis residence was determined for several weather conditions. Fig. 15 shows the temperature distribution at various locations in the living room, which due to the position of the exposed walls, is influenced more by the prevailing weather conditions. For all locations not influenced by convection effects from the windows and floor, the air temperatures are essentially the same.

Floor Coverings

The thermal resistance of the floor covering above the slab influences the surface temperature variation of the panel surface. The equalizing effect depends on the thermal resistance of the floor covering. In addition the water temperature must be increased to provide the same temperature at the surface of the floor covering as would be required at the surface of a slab without any covering. Table 1 gives the average temperature drop through the various floor coverings used in the Minneapolis residence. Zone 1 employs a single thermostat located in the den and a single control valve. The average temperature of the panel water in Zone 1 is relatively constant. The result is that the space temperature in the bathroom runs several degrees higher when heating is required than the space temperature in the den. A marked degree of variation in the thermal resistance of the floor coverings makes it virtually impossible for a single thermostat to maintain uniform temperature levels, a condition usually considered desirable.

Conclusions

1. When a single coil is employed for heat supply to one or more separate enclosures within a space, floor covering of equal thermal resistance should be used

JOURNAL SECTION

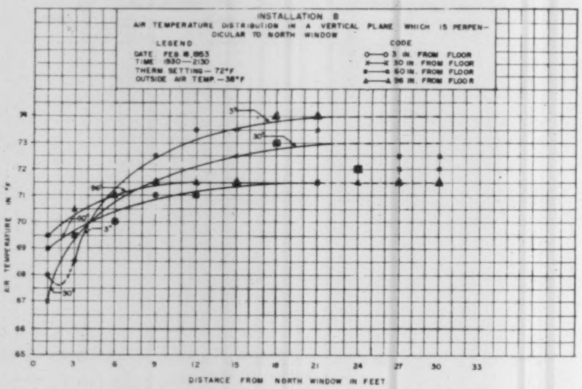


Fig. 14—Air temperature distribution in a vertical plane which is perpendicular to the north window for *Installation B*

Table 1—Effects of Floor Covering

Zone	Location	Floor Covering	Average Temperature of Slab Surface	Average Floor Surface Temperature	Average Temperature Drop Through Floor Covering
1	Bathroom	Tile	86.0	84.0	2.0
	Den	40 oz combination rubber and fiber mat with heavy carpeting	86.0	75.0	11.0
2	Master Bedroom	13/16 in. Oak Parquet	88.0	79.5	8.5
3	Living Room	40 oz combination rubber and fiber mat with heavy carpeting	90.7	80.0	10.7
4	Kitchen	Linoleum	82.1	76.5	5.6

in the separate enclosures. This does not preclude the use of one valve supplying a given inlet water temperature to two or more parallel coils in which an individual hand valve is used with each coil to regulate the rate of flow of water through the individual coil.

2. With two or more zones utilizing a common return header, in a control system employing continuous flow, when the control system calls for no energy supply to the zone being controlled, only return water is circulated through the coils. If other zones within the space require heat, the temperature of the water in the common header is of such magnitude as to cause a temperature drop through the zone in which return water only is recirculated. Consequently, after the individual controls have functioned to stop the supply of energy to the individual zone, a temperature drop through the coil occurs, thus supplying unwanted energy to the zone space. This effect may be seen by observing any condition of the charts representing *Installation B*, in which the space temperature exceeds the set point while concurrently there exists a temperature drop of the water through the coils.

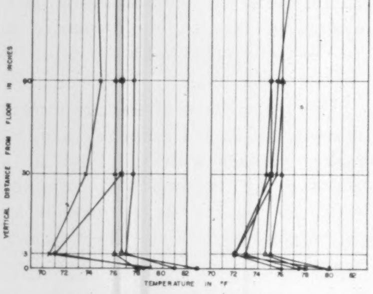
3. The throttling range of a control system employing a throttling or proportioning valve is described as the ratio

$$\frac{\text{thermostat change}}{\text{valve change}}.$$

A narrow throttling range describes the control system which produces a large valve action for a small space temperature change. The throttling range prescribed is selected on the characteristics of the response rate of the heating system and should be adjusted so as to result in a throttling or proportioning action. The limit of the decreasing throttling range is effectively on-off control. Under conditions in which the rate of change in the heating load is greater than the response rate of the control system the operation with proportioning control is essentially two positions.

4. The on-off type valve operation provides a greater variation of panel water temperature with less frequent operation. The frequency of the variation would be directly related to the heating load. The magnitude of the variation would depend on the method of boiler water temperature control. For constant boiler water temperature control, the magnitude of the variation of the panel surface temperature would vary with the heating load; and for variable boiler water temperature the magnitude would be an inverse function of the outside temperature.

5. The damping effect of a mixing valve eliminates the necessity for proportioning control of boiler water temperature. On-off control of the boiler around its control point is perfectly permissible provided the boiler control sensing bulb is located so as to sense the boiler water temperature. Location of the boiler control sensing bulb on the boiler outlet pipe some distance from the boiler tubes results in overheating of the boiler water when no boiler water is being circulated. This condition existed at the *Installation B*, through the 1951-1952 heating season, but was corrected for the 1952-1953 heating season. A comparison of the boiler water temperatures — curve 5 — for the noon period of January 31, 1952 (Fig. 5) with the noon period of January 6, 1953, will illustrate the importance of proper location of the boiler control bulb to sense the true boiler water temperature.



Legend
South Wall 30 percent Glass Area
East Wall 40 percent Glass Area
Floor Covering — 40 oz Foamtread and Heavy Carpeting
Ceiling Height — 8 ft

Fig. 15—Air temperature distribution for living room of Minneapolis residence on March 10, 1953

6. The function of a space thermostat when used in conjunction with reset boiler water temperature is to sense the change in internal or space temperatures which would normally occur from conditions other than the change in outdoor temperature. Several periods are shown throughout the temperature trend charts in which an outside temperature change produced no change in the space temperature. If the boiler water temperature is reset with outdoor temperature, the thermostat functions as an auxiliary or secondary control element of the overall control system. If the boiler water temperature is constant, the thermostat functions as a primary control element of the overall control system. The frequency and magnitude of the varying space temperature for a constant heating load, would depend on the sensitivity and differential of the thermostat.

The complete field studies indicate that more desirable control is effected by adjusting the boiler water temperature with the outside temperature.

7. The effect of the thermal inertia of the panel slab is critical for any type of building where the exposed wall area is in large part glass, since the temperature lag through glass is virtually zero. If the glass area is exposed to solar energy the control problem is increased. Therefore, the addition and proper location of a solar compensator would, in part, alleviate the control problem associated with large glass area exposed to the sun.

For a floor panel heating system, the rate of response of the panel slab has more influence on the space temperature than the rate of response of the controls or the boiler.

8. As shown by the field studies using all the available control systems of each installation, space temperature is controlled much more effectively when the outside temperature is constant, and the heating load is approaching the design load of the system. The effectiveness of controlling a constant heating load decreases, however, when the capacity of the heating system becomes large in relation to the load.

9. The design of a floor panel heating system for a building located in an area having large heating loads should emphasize the concentration of thermal energy at the exposed walls, more especially at the windows, to offset the downdraft of cold air from the cold surfaces. Reduction of this convective effect improves the temperature distribution of the space.

10. The vertical location of the thermostat within the zone being controlled is not critical between the levels of 30 in. above the floor and 12 in. below the ceiling.

Considerable information has been obtained on floor panel heating systems in the field studies to date. Various design improvements are indicated by the results of the installations thus far studied. It is felt that, to warrant further studies of the control of floor panel heating systems, an installation in a controlled environment would be necessary.

Acknowledgments

The authors wish to thank the Barber-Colman Co., Rockford, Ill., the Johnson Service Co., Milwaukee, Wis., and the Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., for the controls which they provided, and the assistance and counsel they rendered.

DISCUSSION

E. L. Sartain, Urbana, Ill.: The authors included in the paper a discussion concerning the effects of carpeting. Here it is indicated that an average temperature difference across the carpeting of about 11 deg for a combination of carpeting and padding was experienced. Over what periods of time was this average taken, what was the outdoor temperature and the variation in outdoor temperature during this time?

C. F. Kayan, New York, N. Y.: To what extent would the authors say the temperature of the water would have to be changed with a carpet in order to maintain the same conditions?

Authors' Closure (Professor Algren): Mr. Sartain's question brings out an important point as to what is considered the surface temperature of the carpeting and how to determine this temperature.

For this phase of the project the instrumentation consisted of a series of 36 thermocouples mounted on a light wooden frame 12 in. wide and 24 in. in length. The carpeting was heavily napped and the temperature recorded varied with the weighting of the frame to which the thermocouples were attached. The temperature at the end of the nap did not represent what we considered to be the effective surface temperature of the carpet as related to comfort.

The equipment was then weighted so as to determine a carpet surface temperature that would represent a comfort foot temperature. Therefore the temperature drop between the temperature of the concrete surface and what we considered the surface temperature of the carpet would be materially reduced over that when using the surface temperature of the nap.

Considering the comfort viewpoint the control of the space should be of such degree as to provide a comfort foot temperature when standing on the carpet.

These results were the average of readings taken over two 12-hr periods with the outdoor temperature varying between 20 and 30 F.

In answer to Professor Kayan's question, the temperature of the water with a carpeted surface would depend upon the insulation under the concrete slab. In this installation the *L* type insulation was used around the perimeter of the room. Three heat flow meters and thermocouples were installed in this area; one between the carpet padding and the top of the concrete slab, one under the concrete slab and one under the 2 in. of insulation.

Heat flow meters were also installed in an area where no insulation was used. The water temperature would be increased about 40 deg without insulation under the slab and approximately 10 to 15 deg with insulation. The reverse heat flow losses are of greater magnitude with carpeting and no insulation under the concrete slab, than with a bare concrete floor. This phase of floor panel installations requires further study and does not readily lend itself to a laboratory study, especially when no insulation is involved.

R. K. MILWARD HONORED BY LIFE MEMBERSHIP

Robert K. Milward, manager of the Detroit Branch of U. S. Radiator Corp., has been granted Life Membership in the Society. He joined the ASHVE in 1920 affiliating with the St. Louis Chapter. Mr. Milward later transferred to the Michigan Chapter and served as its president for one term.

R. K. Milward
Detroit, Mich.

Born on February 27, 1885, at Detroit, Mich., Mr. Milward attended Michigan State College. In 1907 he joined the U.S. Heater Co., working in the Detroit Plant as a forwarder; and from 1909-13 he was employed by U. S. Heater Co. & U. S. Radiator Corp. in Omaha, Neb., as a sales engineer. He left Omaha in 1914 to become manager of the St. Louis Branch of U.S. Radiator in which capacity he acted until 1927. At that time he was transferred to Detroit as manager of the company's branch in that city. In all, Mr. Milward has completed 45 years of service with the company.

Mr. Milward is also a Charter Member of the Engineering Society of Detroit.

ASRE MOVES HEADQUARTERS

The *American Society of Refrigerating Engineers* has announced the new location of its Headquarters office at 234 Fifth Ave., New York 1, N. Y.

The Society will occupy the entire third floor of the new location which has been redecorated, partitioned and air conditioned under the supervision of an *ASRE* Committee consisting of H. F. Spoehrer, Chairman; K. B. Thorndike; H. W. Hottel; and T. J. Phillips; assisted by M. C. Turpin, Executive Secretary; and G. R. Munger, Technical Secretary, of *ASRE*.

JOURNAL SECTION

Research in Europe Stresses Comfort

R. S. Dill, chairman of the Committee on Research of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, spoke recently of developments abroad in the field of human comfort. Aware that ASHVE members are especially interested in the work of European research institutions, Mr. Dill deemed it appropriate to comment on the observations of G. V. Parmelee, research associate, ASHVE Research Laboratory. Following completion of an assignment as technical advisor in building design to the Government of Israel, Mr. Parmelee made a tour of European installations.

His survey indicates important developments in comfort conditioning. Although he reported on a wide range of topics, particular emphasis was given to results of physiological studies as related to heating and air conditioning, panel heating, and heat flow in buildings and building materials.

The British Medical Council's Environment Hygiene Research Unit has completed an environment chamber, 9 x 10 ft, with a fixed ceiling at its new laboratory in London. It is formed by 1-ft wide flat hollow metal ducts through which air is circulated. Twenty-eight such ducts each with individually controlled heating and cooling units provide a considerable variety of surface temperature conditions.

A new wind tunnel has also been constructed. It is a 10 x 10 x 7-ft high working section capable of producing velocities up to 600 fpm. Air is recirculated and part of the air can be by-passed through heat exchangers to obtain temperatures from 40 to 140 F. Dr. Thomas Bedford and his research staff expect to make important contributions to our knowledge of physiological reactions by use of these two new facilities. Dr. Bedford's staff recently completed an extensive investigation on the effects of high temperature and high humidity in Singapore. A paper was published recently on physiological reactions to ceiling panels and further studies of radiation effects are in progress.

Mr. Parmelee's report described a test room in operation at the laboratory of the Cie Nationale des Radiateurs in Paris. Its purpose is to obtain ratings for radiant heating panels. Test panels were made of 2 x 3-ft sections of light weight cast iron grids of tubes to which steel plates are bolted. Some were recessed in the ceiling, others in the walls.

The University of Liège in Belgium has a test room for experiments on hot water radiator ratings. All heating equipment for use in Government financed building projects is checked in this laboratory.

Performance of long panel-type radiators was studied at Delft University, Netherlands. Output, temperature distribution, and the effects of location in rooms were investigated. Test panels consisted of welded steel plates, up to 80 in. in length, with inlet and outlet at the same end.

Comparative performance of floor panel, warm air, and radiator heating was studied at a school in Abbots Langsley by the Heating and Ventilating Division of the British Building Research Station. Its preliminary report appeared in the March 1953 issue of the Journal of the Institution of Heating and Ventilating Engineers. This research station conducts research in all phases of building.

Extensive facilities for panel heating research were found at the National College of Heating, Ventilating, Refrigeration, and Fan Engineering, London. Results of some of its research have been published in the August 1953 IHVE Journal.

Laboratory and field or semi-field experiments on measurements of building material thermal conductance are in progress in England and the Netherlands. Particular emphasis is placed on the influence of moisture on conductivity and methods for rapid determination of k values. Field research is more frequently used in European countries than in the United States.

The British Research Station, in addition to many school studies, conducted several field experiments in Kumwait, Arabian Peninsula, to obtain information on improvement of the thermal performance of low-cost housing there.

In Holland, the Research Institute of Public Health Engineering of the Council for Applied Scientific Research has, for years, carried on a comprehensive study of materials, window types, and heating methods in a 48-family apartment block in Rotterdam. The results of this field experimentation have contributed much to European comfort conditioning knowledge.

Climatic conditions in Europe are such that comfort space cooling problems are of lesser importance than heating and reduction of heat losses. In all European countries a concerted drive to obtain maximum efficiency of fuel utilization is directed at reducing heat losses and conservation of fuel sources. The application of air conditioning to industry is now arousing considerable interest.

The bulk of research abroad has been in the realm of home comfort. Our application of comfort conditioning has mainly been to industry, department stores, office and public buildings. Early European experiments with panel and radiant heating have been expanded by American engineers in further research, experimentation and application. British investigations of radiant heating gave impetus to its widespread application and improvement by American engineers. Comfort conditioning equipment in the United States is being produced on assembly line procedure with resulting decrease in cost to consumers. This has largely been brought about by a longtime custom of exchange of ideas and information between American and European engineers.

F. PAUL ANDERSON AWARD

The Committee of Award for the F. Paul Anderson Medal announces that nominations for the F. Paul Anderson Medal for 1954 are invited. Any member of the Society is eligible for nomination. The award is made in recognition of work done or service performed in the field of heating, ventilating or air conditioning.

Nominations, together with a full statement of the candidates' qualifications and achievements, should be sent to the Committee at ASHVE Headquarters, 62 Worth St., New York 13, N.Y., prior to August 1, 1954.

F. Paul Anderson Committee
J. E. Haines, *Chairman*
Lester T. Avery
S. R. Lewis
L. E. Seeley
B. M. Woods

Let's Aim at the Target

Dear Members:

People with a worthy objective usually lead a more interesting and useful life than those who have no goal. When their purpose is fulfilled they experience a feeling of satisfaction that only comes from accomplishment. The same is true of organizations. ASHVE has a purpose for its existence — a very noble and important purpose.

It is well for all members, especially those of us who serve as Society or Chapter officers, or as members of committees, to remind ourselves of our objectives and to meditate on them. By so doing, we are less likely to allow ourselves to become involved in activities which, at the time, may seem quite appealing but, actually, would contribute little towards furthering the Society's main purpose.

Engineers are responsible persons and persons with responsibility. Therefore, ASHVE regards its purposes as obligations or responsibilities that it has assumed and must fulfill to the best of its ability, which when it is all summed up, is the best of the ability of each member. In order to do this we must understand the meaning and significance of our aims.

Our purpose is outlined clearly and in some detail in our Charter and By-Laws. Expressed in a few words, it is **to advance the Arts and Sciences of Heating, Ventilating, Cooling and Air Conditioning, and the Allied Arts and Sciences, for the Benefit of the General Public.** Furthermore, it should be noted that we **shall be operated exclusively for scientific and educational purposes.**

It is imperative and especially interesting to note that the things we do are more for the benefit of the general public than for Society members. Of course, by following our stated purpose closely we cannot help but advance our industry and profession and greatly improve its prestige.

When we study ways and means of furthering our purposes we find there are certain things we cannot legally do without changing our By-Laws. We cannot, for example, be concerned with the economic status of the engineer or with codes of ethics for our profession. We cannot engage in political lobbying or in legislative activities unless we are specifically invited to give technical advice. Our members, as individuals, are free from such restrictions and they often engage in these activities. If the ASHVE changed its By-Laws to permit its participation in economic and political affairs it would cease to become strictly an educational and scientific Society, and that would change its tax exemption status.

This tax exemption status is determined by the Internal Revenue Service on the basis of the organization's purposes as stated in By-Laws and its interpretation of the same. Because ASHVE is dedicated to serve the public and not, primarily, the interests of its own members it enjoys a very favorable tax exemption status.

It is exempt from the payment of income taxes; the employment taxes are not applicable to it; contributions made to the Society are deductible by donors in computing their net income; gifts made to the Society are deductible for gift tax purposes; also bequests are deductible when arriving at the net value of the estate of a decedent who has made a bequest to the Society. We do not pay taxes on our real estate. We are doing much. We are making plans to do more.

Here are a few of the many ways in which we are furthering the Society's purpose:

(a) Through our research program we are developing fundamental data and discovering basic principles that enable us to design better equipment and systems that will provide, for the benefit of mankind, better health and comfort at lower cost.

(b) Through our various publications and meetings, we disseminate the basic discoveries of ASHVE research, and of other organizations to those who will apply it for public benefit. Our Guide has become the engineering standard of the industry.

(c) Through the codes of ASHVE, and those developed in cooperation with others, we establish procedures and minimum standards of performance and safety for public benefit.

(d) Through our local Chapters we provide the opportunity for chapter members to hear technical talks, exchange ideas with fellow members, and improve themselves for further public service.

We have a very fine record of public service of which we can be justly proud. We have contributed much to improve the well-being, comfort and health of mankind, physically and socially.

The present Society membership has the opportunity, and with it the responsibility, of upholding and maintaining this fine record.

Let's aim straight for the target.

Cordially yours,
L. N. HUNTER, President

Highlights at Houston

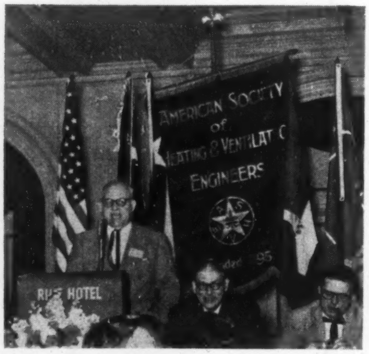
Mayor Roy Hofheinz welcomes ASHVE members to Houston at Monday Luncheon, flanked by E. G. Floeter, Jr. (*left*) and Pres. Reg. F. Taylor

Mrs. C. M. Wilson, H. G. Chapin, Mrs. A. J. Hess, Mrs. Reg. F. Taylor, A. J. Nutting and C. M. Wilson at Mexican Dinner

First Vice Pres. John E. Haines, Mrs. E. R. Queer and Past Pres. A. E. Stacey, Jr., at San Jacinto Inn

(Left to right) C. E. Price, C. Rollins Gardner, J. Donald Kroeker and E. R. Lokey enjoy Shore Dinner at San Jacinto Inn

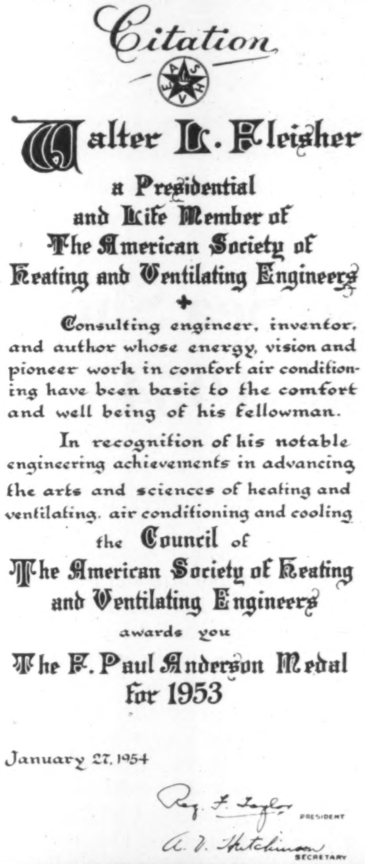
Part of the group of Society members and their wives shown at Acapulco on their Post-Meeting Mexico trip: *(standing)* G. W. F. Myers, Mr. and Mrs. Nicholas Fodor, Mrs. Myers, Mr. and Mrs. F. W. Kramer, R. S. L. Arnold, R. L. Stinard, D. S. Falk, A. M. Robertson, and W. J. Tonesk, tour director. *(seated)* Martinez Vega, Mexican guide, Mr. and Mrs. E. K. Wagner, Mrs. Arnold, Mrs. Stinard, Mrs. Falk, Mr. and Mrs. R. H. Oberschulte and Mrs. Robertson



Morris Frank, toastmaster at Welcome Luncheon at ASHVE 60th Annual Meeting at Rice Hotel, Houston, with Pres. Reg. F. Taylor and Mayor Roy Hofheinz

(The pictures shown on these pages are through the courtesy of William M. Wallace, II, Durham, N.C.)

Past President Walter L. Fleisher receives F. Paul Anderson Medal from Pres. Reg. F. Taylor (citation below)



Citation

Walter L. Fleisher

a Presidential
and Life Member of
The American Society of
Heating and Ventilating Engineers
+

Consulting engineer, inventor, and author whose energy, vision and pioneer work in comfort air conditioning have been basic to the comfort and well being of his fellowman.

In recognition of his notable engineering achievements in advancing the arts and sciences of heating and ventilating, air conditioning and cooling

the Council of
The American Society of Heating
and Ventilating Engineers
awards you
The F. Paul Anderson Medal
for 1953

January 27, 1954

Reg. F. Taylor PRESIDENT
A. V. Hutchinson SECRETARY

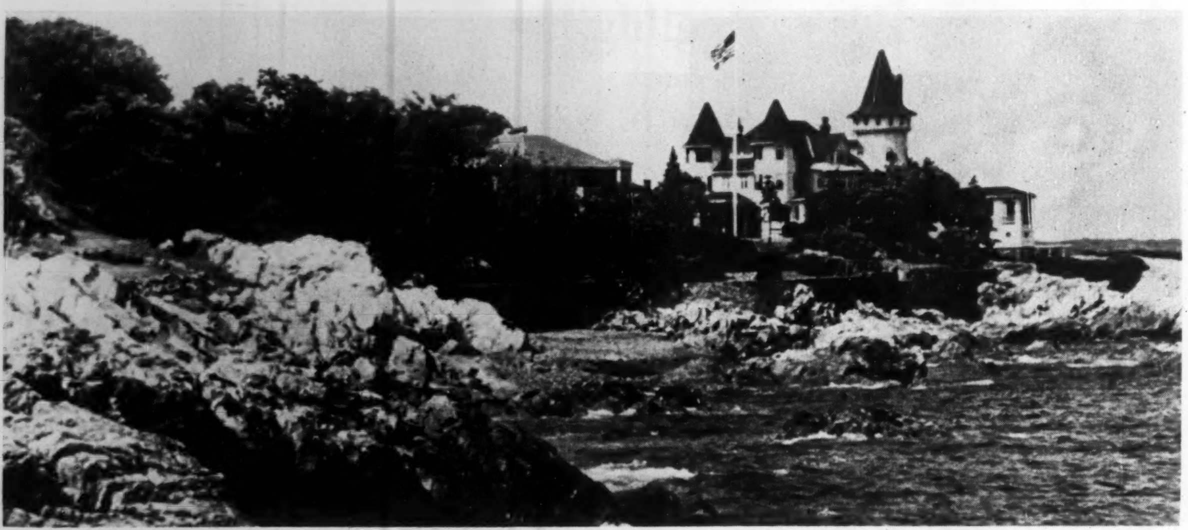
C. H. Pesterfield and A. J. Hess receive congratulations of Pres. Reg. F. Taylor at their installation as Council members during Banquet. (*Seated*) Mrs. Reg. F. Taylor, Dr. W. W. Kemmerer

Dorothy Mildner receives certificate honoring her thirty years of service to ASHVE from John W. James *(left)*

R. T. Kern invites members to attend 1954 Semi-Annual Meeting in Swampscott, Mass., at New Ocean House, June 28-30

Below, left (*left to right*) C. M. Humphreys, R. S. Dill, Carl F. Kayan and P. R. Achenbach

Below, right Past Pres. Merrill F. Blankin admires Past President's Emblem he has just awarded to Reg. F. Taylor



The home shown is typical of the many beautiful homes on the rugged North Shore coast near Swampscott and Marblehead

Bay State Welcomes Society to Sea Shore For Semi-Annual Meeting 1954

SOCIETY MEMBERS, their families and friends, will gather at the New Ocean House, Swampscott, Mass., on the scenic North Shore for the Semi-Annual Meeting, June 28-30, 1954.

The meeting will attract over 600 to this beautiful resort. With a rounded program of technical sessions and a full schedule of special features, everyone will be assured of a worthwhile visit to New England.

The Committee on Arrangements, headed by R. T. Kern, general chairman, A. L. Hare, vice chairman, and Dean L. E. Seeley, honorary chairman, is sparing no effort to make this meeting one of the best ever held. The advance program gives every indication that there will be something to appeal to every member and his family. The unique location of Swampscott on the North Shore of Massachusetts, adjacent to some of this country's most famous historic sites, affords the opportunity to enjoy educational and historic landmarks.

The development of the technical program is well advanced and the Program and Papers Committee has selected some important subjects for discussion dealing with physical responses to environment, air filtration, solar radiation studies, operating cost of residential cooling systems, relation of room size and panel area, studies of vertical jets for hot and cold air, downward throw of heated jets, and noise in piping systems.

During the off-hours when members are free from attending technical sessions and committee meetings, the Committee on Arrangements is planning such diversions as an all-day boat trip to Cape Cod, the annual golf meet at Tedesco Country Club, a visit to the fishing port of Gloucester, *Engineers' Night* at the Boston Pops Concert, and a special program for the children and teen-agers.

In the area surrounding Swampscott there are many places that are well known to students of American history, and many of these may be visited en route to the meeting or following the meeting. In Boston special points of interest are the State House on Beacon Hill for which the

Committee on Arrangements

R. T. Kern, *General Chairman* — A. L. Hare, *Vice-Chairman*

Dean L. E. Seeley
Honorary Chairman

Committee Chairmen

Banquet — G. D. Fife
Entertainment — L. R. Geissenhainer
Finance — W. H. Shipp
Ladies — D. M. Archer
Publicity — J. M. Means
Reception — G. W. Sprague
Sessions — John Bonner
Sports — W. G. Burbo
Transportation — H. L. Farrow

New Ocean House Room Rates

(All rates shown include meals and are daily per person)

Double Room, twin beds and bath	$11.50, $12.00 and $12.50
Double Room, twin beds and bath (*Hotel Cottages*)	$11.25 and $11.50
Large Room, three beds and bath	$10.75 and $11.00
Large Room, four beds and bath	$10.25 and $10.50
Double Room, twin beds, and running water	$10.75 and $11.00
Suite, 2 double rooms, four beds and bath between	$11.00 and $12.00
Suite, 2 double rooms, five beds and bath between	$10.75
Suite, 2 double rooms, six beds and bath between	$10.25 and $10.50
Choice Corner or Bay-Window Room, twin beds and bath	$13.00 and $13.50
Single Room and bath (*Limited Number*)	$13.00, $14.00 and $15.00
Single Room and bath (*Hotel Cottages*)	$12.50 and $13.00
Single Room and running water (*Hotel Cottages*)	$12.00

cornerstone was laid on Independence Day, 1795; Bunker Hill Monument on Breed's Hill, Charlestown; Old South Meeting House built in 1729; Faneuil Hall built in 1742, serving as the Armory of the Ancient and Honorable Artillery, the oldest military organization in the country; Paul Revere House, the Old North Church and the U. S. Frigate Constitution (Old Ironsides) at Charlestown Navy Yard.

Members are urged to bring their families, and they will find that attractive rates prevail at the New Ocean House as shown in the accompanying table. Members will receive reservation forms by mail, and applications for accommodations should be sent promptly. The Committee on Arrangements will appreciate early reservations for special events on the forms to be furnished to members.

Swampscott is located 12 miles north of Boston, is served by the Boston & Maine Railroad, and is served by the Logan International Airport in Boston. For those who are driving it would be well to select your route and those coming by rail or air should consult their timetables when summer schedules go into effect in April. It is time to make plans now to visit Swampscott, Mass., and historic New England. The Semi-Annual Meeting dates are June 28-30.

Bunker Hill Monument, Breed's Hill, Charlestown, marks battle between the Americans and the British on June 17, 1775. The monument was begun in 1825 and Lafayette laid the cornerstone while Daniel Webster delivered the oration.

Typical *Round Trip* First Class Railroad and Airline Fares to Boston

Airline*

Albany, N. Y.	$ 21.08
Atlanta, Ga.	136.05
Buffalo, N. Y.	56.81
Charlottesville, Va.	68.66
Cincinnati, Ohio	101.55
Chicago, Ill.	115.46
Columbus, Ohio	88.67
Denver, Colo.	236.44
Dallas, Tex.	214.36
Detroit, Mich.	86.83
Houston, Tex.	235.87
Indianapolis, Ind.	113.44
Kansas City, Kan.	172.50
Memphis, Tenn.	161.23
Milwaukee, Wis.	111.65
New Orleans, La.	193.43
New York, N. Y.	26.57
Oklahoma City, Okla.	204.93
Philadelphia, Pa.	39.33
Pittsburgh, Pa.	71.65
Portland, Ore.	363.98
St. Louis, Mo.	142.26
San Francisco, Calif.	363.98
Syracuse, N. Y.	39.68
Seattle, Wash.	363.98
Toronto, Ont.	57.50
Washington, D. C.	55.89

*Tax included

Railroad

	ROUND TRIP* FIRST CLASS	ONE-WAY LOWER BERTH PULLMAN
Albany, N. Y.	$ 20.89	$ 5.75
Atlanta, Ga.	100.05	13.74
Baltimore, Md.	45.06	6.33
Buffalo, N. Y.	51.14	5.75
Charlotte, N. C.	79.35	12.59
Chicago, Ill.	101.74	11.45
Cincinnati, Ohio	93.05	10.24
Cleveland, Ohio	68.32	7.54
Columbus, Ohio	81.72	9.55
Dallas, Tex.	147.48	20.53
Dayton, Ohio	88.62	9.55
Denver, Colo.	171.20	21.85
Des Moines, Ia.	125.77	23.20
Detroit, Mich.	74.71	8.74
Grand Rapids, Mich.	90.60	10.24
Greensboro, N. C.	71.76	11.33
Houston, Tex.	155.41	21.22
Indianapolis, Ind.	96.15	11.45
Jackson, Miss.	129.61	19.38
Kansas City, Mo.	132.56	15.87
Little Rock, Ark.	128.45	16.68
Los Angeles, Calif.	244.14	34.04
Memphis, Tenn.	124.43	15.87
Milwaukee, Wis.	107.49	12.25
Minneapolis, Minn.	129.04	14.10
Newark, N. J.	27.32	5.75
New Haven, Conn.	13.17[a]	1.73 (Seat)
New Orleans, La.	$137.43	$18.06
New York, N. Y.	23.80	4.66
Norfolk, Va.	67.14	10.41
Oklahoma City, Okla.	149.09	21.00
Omaha, Nebr.	135.14	15.87
Philadelphia, Pa.	35.14	5.75
Pittsburgh, Pa.	67.56	7.53
Portland, Ore.	230.79	33.24
Sacramento, Calif.	244.14	34.04
St. Louis, Mo.	118.81	13.29
Salt Lake City, Utah	201.95	25.99
San Antonio, Tex.	164.05	23.18
San Francisco, Calif.	244.14	33.64
Seattle, Wash.	230.79	33.24
Shreveport, La.	137.07	21.68
Spokane, Wash.	230.79	29.41
Syracuse, N. Y.	35.04	5.75
Toronto, Ont.	52.43	5.80
Tulsa, Okla.	145.35	19.61
Vancouver, B. C.	200.68	28.90
Washington, D. C.	48.99	6.67
Wichita, Kan.	146.82	21.00
Winnipeg, Man.	144.54	19.83

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*The 15% Federal Tax has been included in these fares.

[a] RT Parlor car travel.

JOURNAL SECTION

1953 Annual Report — Committee on Research

R. S. Dill, Chairman

R. S. Dill, Chairman Committee on Research

This report is perhaps unique among Reports of Committees on Research in that it contains an account of some difficulties; these must be recorded and considered. First, it was found necessary to reduce the research budget this fiscal year; second, during the year, the Laboratory has lost personnel which we have been unable to replace; and last, but not least, we lost the Director of Research, Cyril Tasker, by death from a heart attack on May 27. Mr. Tasker, as you know, was a man of energy and ability, and it is possible that our other difficulties could have been avoided or at least ameliorated if his talents, and particularly his knowledge of research affairs, had continued to be available to us. C. M. Humphreys was appointed Acting Director of Research, by Council, at its July meeting, and his experience at the Laboratory was undoubtedly beneficial in carrying forward our program. The Laboratory and cooperative projects have therefore produced data and papers according to their intended functions and some details worthy of note are set forth below.

Budget and Finances

The research budget for the last fiscal year (ending October 31) was $178,390. The actual expenditures and sources of funds are shown by Fig. 1 and the relation between expenditures during this and previous years is shown by Figs. 2 and 3.

Actual expenditures were less than the budget chiefly because manpower was not available to activate some projects upon which the budget was based. Both the staff and the annual budget should be increased. The matter of fund raising is now under serious consideration by the Ways and Means Committee, and it is probable that it will offer Council some recommendations to this end at the Houston meeting. A possible reason for lack of ample funds for all purposes may be that the Society's activities under the Committee on Research have not been made well enough known to the membership and to the sponsors of projects. The Committee on Research and the Technical Advisory Committees are known to be manned by capable and willing individuals and the merit of their actions is apparent to anyone attending their meetings or listening to their discussions. An urgent need, therefore, is for better dissemination of information which may be achieved by more frequent progress reports and an improvement in research papers in regard to clarity of conclusions and applicability of results. To achieve this, it is fairly clear that additional literary ability must somehow be added to the laboratory staff, since the present staff is not large enough to conduct its work and also produce the necessary reports and papers. A recommendation that a competent technical writer be added to the staff has been on record for several years, and it is to be hoped that competent help of this kind can be attracted to our service soon. There is strong argument that the duty of the Director of Research should be largely that of an editor because on our papers depend the future and fate of the Research Laboratory and of the research activity. At least, if the Director does not critically edit all laboratory papers, he should have available someone on whom he can depend for this purpose.

Committee on Research

R. S. Dill, *Chairman*; B. H. Jennings, *Vice Chairman*; C. M. Humphreys, *Acting Director of Research.*

Three Years: R. S. Dill, F. H. Faust, R. W. Keeton, M.D., H. A. Lockhart, J. W. McElgin.

Two Years: I. W. Cotton, W. A. Grant, N. B. Hutcheon, B. H. Jennings, C. O. Mackey.

One Year: A. B. Algren, John Everetts, Jr., A. J. Hess, T. H. Smoot, W. N. Witheridge.

Executive Committee: R. S. Dill, *Chairman;* B. H. Jennings, *Vice Chairman;* John Everetts, Jr., F. H. Faust, C. O. Mackey.

Long Range Research Program: B. H. Jennings, *Chairman;* John Everetts, Jr., F. H. Faust, John W. James, C. O. Mackey, R. S. Dill, Ex-Officio.

B. H. Jennings, Vice Chairman Committee on Research

Laboratory Staff

The laboratory staff has lost a number of members in the last several years. It is apparent that those remaining have considerable competence in their various fields and a desirable loyalty to ASHVE, but they are too few in number.

The present staff consists of the following members: C. M. Humphreys, Acting Director of Research; G. V. Parmelee, Research Associate; R. G. Huebscher, Research Fellow; L. F. Schutrum, Research Fellow; J. G. Slaby, Research Engineer; D. J. Vild, Assistant Research Engineer; John Vouris, Assistant Research Engineer; H. H. Huebscher, Mechanic; W. F. Trapp, Janitor; I. M. Jahn, Secretary and Administrative Assistant to the Director; Doris Gates, Senior Technical Assistant; Betty Fitzpatrick, Bookkeeper; R. E. Gojsza, Secretary-Stenographer; L. B. Cannon, Secretary-Stenographer.

As stated, this staff should be augmented and, certainly, further losses should be avoided. Technical writing ability now exists among present staff members and should be given opportunity to flourish. Additional help should also be obtained to relieve anyone assigned to writing.

Lack of adequate staff is now hampering authorized work. In particular the projects on odors, sensations of comfort, and others are suffering from this cause. There is reason to believe that our salary scale is not high enough to attract new graduates from technical schools or colleges and, at its meeting on January 4, the Research Executive Committee approved Mr. Humphreys' suggestion that he survey the situation in further detail and prepare some recommendations for consideration by the Committee on Research at the January meeting in Houston.

Research Policy and Planning

The Operational Guide for the Committee on Research has been approved and is now in force so that the functions of the Committee, the Director of Research and the laboratory staff are better defined than heretofore. There is now a Council Committee on Long Range Planning, which will submit some recommendations during the Houston meeting, and this is expected to yield further guidance of the research program. Also, the Committee on Research has had a Long Range Research Program for several years and this program is now under review by a subcommittee under the chairmanship of Prof. B. H. Jennings. The research activity of the Society is therefore under examination from several directions and we can hope that the serious consideration now being given it will render the program even more valuable than heretofore.

Research Projects

During the fiscal year ending last October, there were 10 active projects at the Research Laboratory at Cleveland and 16 cooperative research projects at various institutions over the country. These projects are enumerated in the Report of the Acting Director of Research in his discussion of Technical Advisory Committee activities. In this report, some details are given on a few of the numerous accomplishments as follows:

On the subject of radiant heating, the output of floor panels and the resultant room air temperatures were established for steady state conditions and for several different infiltration rates. Experimental work was done in the Environmental Laboratory at Cleveland, and can be expected to go far toward settling long-standing controversies on this subject. On ceiling panels, information was gathered on the effect of good *vs.* poor construction and the importance of good contact between tubes and lath was shown. The data should, of course, be prepared soon for presentation in THE GUIDE and for use by manufacturers in design manuals.

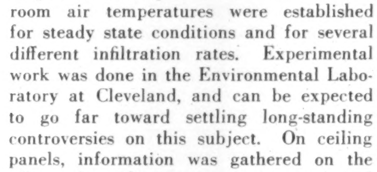


Fig. 2 — Research expenditures 1943 — 1953

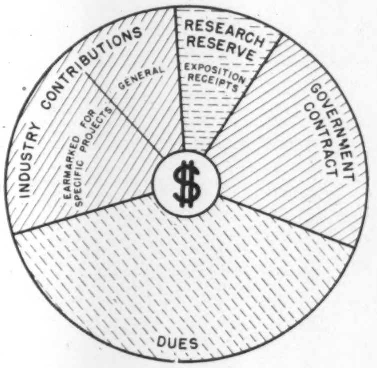


Fig. 1 — Sources of funds expended on Society research in 1953

Dues	$ 64,381
Contributions	
Earmarked	29,331
General	17,535
Government Contract	34,798
Research Reserve	13,981
	$160,026

On window heat gain, data were obtained on the solar heat gain through windows with several shading devices of the venetian-blind type. These data are expected to appear in the next issue of THE GUIDE and should be of much interest to designers since shading is one important means of reducing required air conditioning capacity for buildings. The work was done in the solar calorimeter at the Cleveland Laboratory under the supervision of G. V. Parmelee, and additional work and a follow-up paper are in prospect giving the relation between radiation and convection components of the heat released from these shading devices.

On thermal insulation, the Laboratory has assisted the Technical Advisory Committee concerned through the efforts of M. L. Erickson and, later, D. J. Vild. By means of questionnaires sent to various laboratories, data are being gathered for revising a chapter on Thermal Insulation in THE GUIDE, with the purpose of publishing heat transfer coefficients for the various materials. Rather than citing data from a single source for a given material the objective is to publish acceptable values based on laboratory tests and weighted in accord with the Committee's judgment. M. W. Keyes' TAC on Insulation will deserve the thanks of the Society and of the profession for this accomplishment.

On the superheating of water, the phenomenon has been demonstrated in glass vessels at Northwestern University by Prof. B. H. Jennings and his associates as part of the project under the auspices of John W. James' TAC on Hot Water and Steam Heating. Experiments to investigate the effect in conventional boilers are in prospect.

Since the various projects are dealt with in detail in the report of the Acting Director of Research, no attempt is made to cover them here.

During the Society year now commencing the obvious immediate objectives of the research program include the installation of a permanent Director of Research. It is not yet certain that all worthy candidates have been considered for nomination so that the Committee on Research may propose a further postponement to assure all interested parties an opportunity to present their cases.

The staff at the Laboratory should be augmented immediately if possible and the salary scale and other contributing factors must be adjusted to this end.

The arrangement for producing and editing papers must be formulated and put into operation.

The effort to attain closer liaison and cooperation between the Technical Advisory Committees, the Committee on Research, the Laboratory and the cooperating institutions must be continued. The short term or present program must be prosecuted as effectively as possible and due consideration must be given to the long-range program.

Research Papers

The Research Program of the ASHVE yielded 15 papers for presentation at meetings and publication in the ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, as follows:

1. Moisture Movement in Soils Due to Temperature Difference, by W. A. Hadley and Raymond Eisenstadt (New York, N. Y.) (June 1953, JOURNAL SECTION).
2. Further Studies of the Thermal Characteristics of Plaster Panels, by L. F. Schutrum and C. M. Humphreys (Cleveland, Ohio) (June 1953, JOURNAL SECTION).
3. Heat Exchanges in a Floor Panel Heated Room, by L. F. Schutrum, G. V. Parmelee and C. M. Humphreys (Cleve-

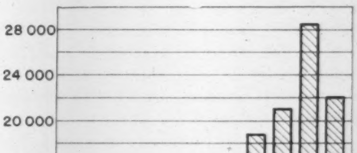


Fig. 3 — ASHVE direct grants to cooperating colleges and universities 1943 — 1953

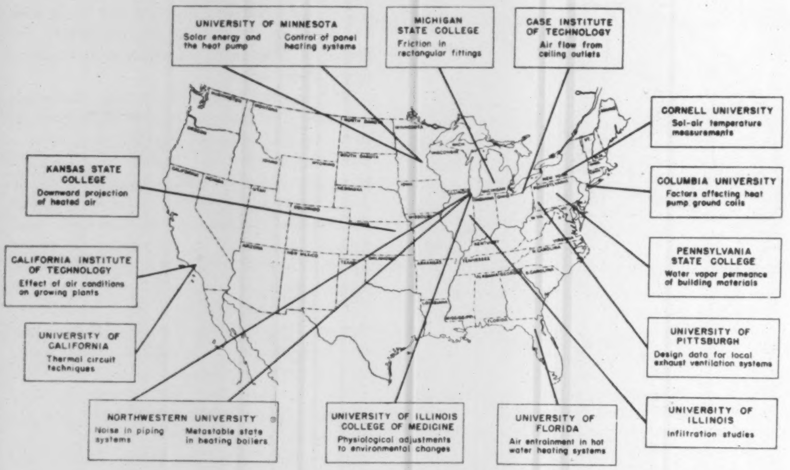

UNIVERSITY OF MINNESOTA
Solar energy and the heat pump
Control of panel heating systems
MICHIGAN STATE COLLEGE
Friction in rectangular fittings
CASE INSTITUTE OF TECHNOLOGY
Air flow from ceiling outlets
CORNELL UNIVERSITY
Sol-air temperature measurements
KANSAS STATE COLLEGE
Downward projection of heated air
COLUMBIA UNIVERSITY
Factors affecting heat pump ground coils
CALIFORNIA INSTITUTE OF TECHNOLOGY
Effect of air conditions on growing plants
PENNSYLVANIA STATE COLLEGE
Water vapor permeance of building materials
UNIVERSITY OF CALIFORNIA
Thermal circuit techniques
UNIVERSITY OF PITTSBURGH
Design data for local exhaust ventilation systems
NORTHWESTERN UNIVERSITY
Noise in piping systems
Metastable state in heating boilers
UNIVERSITY OF ILLINOIS COLLEGE OF MEDICINE
Physiological adjustments to environmental changes
UNIVERSITY OF FLORIDA
Air entrainment in hot water heating systems
UNIVERSITY OF ILLINOIS
Infiltration studies

Fig. 4 — ASHVE Cooperative Research — 1953

land, Ohio) (July 1953, Journal Section).

4. Automatic Permeance Measurement by the Permeometer, by F. A. Joy and A. W. Sherdon (State College, Penna.) (July 1953, Journal Section).

5. Experimental Approaches to the Study of Noise and Noise Transmission in Piping Systems, by W. L. Rogers (Evanston, Ill.) (July 1953, Journal Section).

6. Effect of Relative Humidity on Heat Loss of Men Exposed to Environments of 80, 76, and 72 F, by Tohru Inouye, F. K. Hick, M.D., S. E. Telser, M.D., and R. W. Keeton, M.D. (Chicago, Ill.) (August 1953, Journal Section).

7. Design Data for Slat-Type Sun Shades for Use in Load Estimating, by G. V. Parmelee and D. J. Vild (Cleveland, Ohio) (September 1953, Journal Section).

8. Heat Flow Analysis in Panel Heating or Cooling Sections, Case II — Floor Slab on Earth with Uniformly Spaced Pipes or Tubes at the Slab-Earth Interface, by H. B. Nottage, C. V. Franks, L. E. Hulbert and L. F. Schutrum (Cleveland, Ohio) (May 1953, Journal Section).

9. Circuit Analysis Applied to Load Estimating, by H. B. Nottage and G. V. Parmelee (Cleveland, Ohio) (To be published in the Journal Section).

10. Effects of Non-Uniformity and Furnishings on Panel Heating Performance, by L. F. Schutrum and C. M. Humphreys (Cleveland, Ohio) (February 1954, Journal Section).

11. Field Studies of Floor Panel Control Systems, Part II, by A. B. Algren, E. F. Snyder, Jr., and R. R. Head (Minneapolis, Minn.) (To be published in the Journal Section).

12. Solar Energy Availability for Heating in the United States, by R. C. Jordan and J. L. Threlkeld (Minneapolis, Minn.) (December 1953, Journal Section).

13. Utilization of Solar Energy for House Heating, by R. C. Jordan and J. L. Threlkeld (Minneapolis, Minn.) (January 1954, Journal Section).

14. Design and Economics of Solar Energy Heat Pump Systems, by R. C. Jordan and J. L. Threlkeld (Minneapolis, Minn.) (February 1954, Journal Section).

15. Effects of Air Conditioning on Plant Growth, by F. W. Went (Pasadena, Calif.) (To be published in the Journal Section).

Of these papers, the first eight were presented at the Denver meeting of the Society in June and the remainder were made available for presentation at Houston in January of 1954.

In prospect for the Summer meeting at Swampscott, we have papers as follows:

1. Physiological Responses to Sudden Changes in Atmospheric Environment — Studies of Obese, Hypothyroid and Hyperthyroid Patients, by F. K. Hick, M.D.; Tohru Inouye, R. W. Keeton, M.D., and Lionel Bernstein, M.D.

2. Downward Throw of Heated Jets, by Linn Helander.

3. Computing Temperatures and Velocities in Vertical Jets of Hot or Cold Air, by Alfred Koestel.

4. Study of the Resistances of Rectangular Fittings Designed to Accomplish Divided Air Streams, by L. G. Miller.

5. A paper on Noise in Piping Systems from Northwestern University.

6. The Measurement of the Angular Emissivity of Various Surfaces, by Aydin Umur, G. V. Parmelee and L. F. Schutrum.

7. Cooling Load Due to Transmitted Solar Radiation as Determined by Circuit Analysis, by G. V. Parmelee and H. B. Nottage.

8. Modifying Effects of Room Size and Panel Area on Panel Heat Output and Room Air Temperature, by L. F. Schutrum and G. V. Parmelee.

9. A paper from Case Institute of Technology on the behavior of cooled jets, with special reference to ceiling outlets.

ASHVE RESEARCH IN COOPERATING INSTITUTIONS

California Institute of Technology, Pasadena, Calif.: (Research Fellowship) The Role of Air Conditions in Plant Growth, Plant Reproduction and Photosynthesis.

University of California, Los Angeles, Calif.: Thermal Circuit Techniques Applied to Heating and Cooling Problems.

Case Institute of Technology, Cleveland, Ohio: (Research Fellowship) Air Flow from Annular Slots, Ceiling Plaques and Circular Diffusers.

Columbia University, New York, N. Y.: The Investigation of Thermally Actuated Moisture Migration in Granular Media. (Heat Pump)

Cornell University, Ithaca, N. Y.: The Sol-Air Thermometer and the Sol-Air Temperature Concept.

University of Florida, Gainesville, Fla.: Air Entrainment in Hot Water Heating Systems.

University of Illinois, College of Engineering, Urbana, Ill.: Study of Infiltration in a Residence Using the Tracer Gas Technique.

University of Illinois, College of Medicine, Chicago, Ill.: The Physiological Adjustments made by Healthy and Physically Impaired Persons to Rapid Changes in Atmospheric Environment.

Kansas State College, Manhattan, Kan.: The Downward Projection of Heated Air Streams.

Michigan State College, East Lansing, Mich.: Friction in Rectangular Branch Take-Off Fittings.

University of Minnesota, Minneapolis, Minn.: (*a*) Solar Energy as a Potential Heat Source for Heat Pump Installations. (*b*) (Research Fellowship) — Field Studies on the Control of Panel Heating Systems.

Northwestern University, Evanston, Ill.: (*a*) Noise in Piping Systems. (*b*) Metastable State of Water as a Possible Explosion Hazard in Heating Boilers.

The Pennsylvania State College, State College, Pa.: (Research Fellowship) — The Water Vapor Permeance of Building Materials.

University of Pittsburgh, Pittsburgh, Pa.: (Research Fellowship) — Design Requirements of Local Exhaust Ventilation for Control of Atmospheric Contaminants Released by Hot Industrial Processes.

Report of Acting Director of Research

By Clark M. Humphreys

The Chairman of the Committee on Research has mentioned in his report the great loss suffered by the Laboratory last May with the passing of Mr. Tasker. Since that time every effort has been made to carry on the work of the Laboratory in accordance with the principles which he had established.

Staff

During 1953, the Research Laboratory, like other research organizations and industries throughout the country, found it increasingly difficult to obtain enough trained personnel to maintain its planned research schedule. Every effort is being made to increase the Laboratory staff.

Aydin Umur, after working at the Laboratory for about one year, completed the work for his Masters Degree at Case Institute of Technology, and returned to his home in Turkey. His thesis, Measurement of Angular Emissivity, was a report of work done at the Laboratory. Mr. Umur was replaced by a Case graduate student from Greece.

M. L. Erickson, supervisor of work on periodic heat flow through roof sections, and the researcher responsible for the collection of thermal data on building materials, left the Laboratory to aceept a position in research work at the University of Minnesota.

Equipment and Facilities

Equipment and facilities at the Research Laboratory continue to increase with each passing year. Although no major piece of equipment was added during 1953, important additions to instrumentation and equipment were made.

It is imperative that major work soon be undertaken at the Laboratory in the field of periodic heat flow. Considerable thought has been given to the type of computing apparatus or analogue equipment best suited for such work. It is hoped that definite steps may be taken to provide such equipment for the Laboratory in 1954.

Guide

Development of fundamental data valuable to the heating and air conditioning industry is the ultimate goal of all Society research. It is not surprising, therefore, that new data, evolved under the Society's research program are found in THE GUIDE each year. THE GUIDE 1954 will contain Research Laboratory data on the effect of slat-type shades in reducing solar heat gain through sunlit glass.

During the past year, several Technical Advisory Committees have taken a very active part in the task of reviewing and revising THE GUIDE.

Air Distribution and Air Flow

During 1953, three cooperative research projects have been carried on under the guidance of the TAC on Air Distribution.

Air Distribution Studies (Case Institute of Technology): Cooperative research on air distribution, in progress at Case Institute of Technology for many years, has been the subject of a number of papers presented before the Society. At the present time, two separate studies are under way. One is concerned with the performance of radial jets of heated or cooled air discharged at various angles; the second is to determine the laws governing the intermixing of two or more jets, the natural streams of which tend to overlap. Results of the first of these studies should find practical application in the prediction of the performance of ceiling diffusers. The occurrence of overlapping air jets is so common in air conditioned spaces that the application of this study to practice is evident.

Work on these projects has involved study of related problems and obtained interesting results. A paper, Computing Temperatures and Velocities in Vertical Jets of Hot or Cold Air, by Alfred Koestel, has been submitted and will be published in the near future. The treatise presents an analytical solution for performance of a jet of air discharged vertically upward or downward.

Downward Projection of Heated Air (Kansas State College): Work on this cooperative research project continued throughout 1953 with the active support of the *Industrial Unit Heater Association*. Original work was done with jets discharging vertically downward from standard *ASME* nozzles. Tests were then made with a commercial unit heater, and the results correlated. An original draft of a technical paper, submitted last September, presented empirical equations for relating the performance of a unit heater to that of an *ASME* nozzle. Revisions are being made and the paper's presentation may be expected at the Semi-Annual Meeeting.

As a by-product of this investigation, an electronic pressure-differential recorder has been developed which will permit the automatic recording of velocity measurements made with a pitot tube. This instrument will greatly facilitate further work on this project.

Friction in Rectangular Take-Off Fittings (Michigan State College): A study has been made of the frictional resistance of three different types of rectangular branch take-off fittings. Each fitting was tested with various percentages of the total flow through the continuing trunk and its branch outlets. Pressure losses in both streams were determined. The experimental phase has been completed and a report on results of the work is being prepared.

Air Cleaning

At the meeting of the TAC on Air Cleaning held in January 1953, it was decided not to submit the third draft of the proposed ASHVE filter test code to the Committee on Research. Since that time, there has been no further work on the development of a Society code on air cleaning.

The Committee on Research was asked by the *Air Filter Institute* to recommend that the 1933 ASHVE Filter Test Code be rescinded, and to recognize and approve the *AFI* test code, but no action was taken.

Combustion

Some time ago, in presenting its long-range program to the Committee on Research, the TAC on Combustion indicated that problems associated with pulsation in oil flames and resonance in gas flames merited high priority. In response to contacts made by the Chairman and other members of the Committee, a number of proposals for cooperative research on these subjects have been received.

Financing of the work has recently been arranged through agreements with *Oil Heat Institute* and the *American Gas Association*, under which each group will contribute one third of the required funds.

A steering committee, to consist of three representatives of each of the three sponsoring organizations, is being formed to direct the project. One of the first tasks for this group will be to select a suitable laboratory. It is hoped that the project will be activated in the very near future.

Cooling Loads

All activities under the guidance of the TAC on Cooling Load during 1953 were pointed toward development of more accurate methods for determining instantaneous equipment loads. Studies on this subject are being made at the Society Laboratory and at cooperating institutions.

Air Conditioning Thermal Circuit (ASHVE Research Laboratory): In 1951, H. B. Nottage developed the thermal circuit concept to portray and interrelate factors which influence the instantaneous equipment load. To test the feasibility of this method of approach, equations were written for the heat gain to a single room with northern exposure, in one case with a large glass block panel, and in another, with an ordinary window glass. In both cases, direct radiation through the glass was neglected. The equations were solved with the aid of calculating equipment at Case Institute of Technology. A comparison of the results thus obtained, with those calculated by the method now outlined in THE GUIDE, which does not consider the heat capacity of the internal structure, demonstrates the importance of considering the entire thermal system. A report on this work was presented at the Houston meeting.

As a second phase of this problem, equations for the same room have been rewritten to include radiation directly transmitted through glass. As before, solutions were obtained by computing equipment and are now being subjected to further analysis.

Extension of this initial effort in analysis of complete thermal systems involving periodic heat flow is highly desirable. Thermal circuit analysis can make important contributions in a variety of problems in the field of heating, ventilating, and air conditioning. Further work in this direction is being considered.

Periodic Heat Flow Through Roof Sections (ASHVE Research Laboratory): During the summer of 1953, experiments were conducted to determine the periodic heat flow through roofs. Two roof sections, one of heavy and one of light construction, were used. The heavy section consisted of 3-in. concrete, 2-in. rigid insulation, and built-up roofing. The lighter section consisted of a 3-in. precast calcium silicate slab to which built-up roofing was applied.

Test sections were mounted horizontally in the calorimeter previously used for the glass studies. Calorimeter surface below the slab was maintained at a constant temperature while the top of the slab was exposed to the weather for test periods of at least 36 hr. Heat flow meters on top and bottom surfaces of the roofs measured heat entering or leaving the surfaces. The heavy roof section was tested, first with the insulation on top, then with the concrete on top.

At the present time, the experimentally determined heat transfer rates are being compared with results obtained by application of the theory for multi-layer construction proposed by C. O. Mackey and D. K. Wright, Jr.

Thermal Circuit Techniques Applied to Heating and Cooling Problems (University of California): The first phase of this new cooperative study of thermal circuit techniques applied to heating and cooling problems is prediction of the thermal environment inside a one room test house by analyzing the thermal circuit representing the heat transfer system. This analysis is being done with an equivalent resistance-capacitance electrical network and appropriate input devices to represent the boundary conditions. The elements of this network are now being developed and assembled.

Results of analogue solutions will be checked against experimental data, obtained for the test house on several clear days last September.

Joint IES-ASHVE Committee: During 1953 a joint *IES*-ASHVE Committee was formed to consider matters of common interest to the two groups. The committee, which consists of three members appointed by each society, has held two meetings. One of the aims of the Committee is to prepare suitable authoritative data on subjects of mutual interest for THE GUIDE and the *IES Lighting Handbook*.

Heat Flow Through Glass: Work performed under guidance of the TAC on Heat Flow Through Glass and discussed herein under that heading, has direct application to the calculation of cooling loads. Close liaison has always been maintained between the TA Committees on Cooling Load and Heat Flow Through Glass.

Evaporative Cooling

During 1953, a new Technical Advisory Committee on Evaporative Cooling was organized under the chairmanship of A. J. Hess. The Committee is broken down into three sub-committees on Cooling Towers, Evaporative Condensers, and Evaporative Air Cooling.

The Committee is now considering a proposal for cooperative research.

Heat Flow Through Glass

All experimental work on the shading of sunlit glass was completed in 1952 but analytical work on this subject has continued throughout 1953. The results were presented in the form of practical design data at the Denver meeting in the paper, Design Data for Slat Type Sun Shades for Use in Load Estimating, by G. V. Parmelee and D. J. Vild.

Another paper, Convection and Radiation Gain from Windows with Slat-Type Sun Shades, is being prepared and should be ready for presentation at the 1954 Semi-Annual meeting.

Some analysis has been made of solar radiation data, taken at the Laboratory during the last seven years. Papers on this, and on two other secondary phases of the studies on heat flow through glass, will be prepared during 1954.

Heat Pump

Moisture Migration in Granular Media (Columbia University): To develop information on the heat absorbed by ground coils, a radioactive tracer technique was used to study moisture migration in a simulated soil made up of small glass beads. Experimental work, performed under a cooperative research agreement with the Society, was completed in 1952, and a paper, Moisture Movement in Soils Due to Temperature Difference, by W. A. Hadley and Raymond Eisenstadt, was presented at the Semi-Annual Meeting in Denver.

Solar Energy as a Heat Source for the Heat Pump (University of Minnesota): A study of the feasibility of using solar energy as a heat source for the heat pump has been in progress at the University of Minnesota since 1952 under a cooperative research agreement with the Society. The investigation is completed. Findings are contained in three papers to be presented at the 1954 Annual Meeting, prepared by R. C. Jordan and J. L. Threlkeld.

The first paper of the series, Solar Energy Availability for Heating in the United States, deals with availability of solar energy during cold winter months in various parts of the country. The superiority of a south-facing collector surface is demonstrated, and maps showing the estimated average daily radiation incident on such a surface are presented for December and January.

The second paper, Utilization of Solar Energy for House Heating, discusses solar collectors and presents a rational method for calculating their efficiency. Storage of solar energy is considered and different methods compared. A method is developed for estimating the coefficient of performance of a heat pump, and practical coefficients of performance for single stage and step condensation systems are given.

The last paper of the series, Design and Economics of Solar Energy Heat Pump Systems, considers some of the more practical problems involved in the design of solar collectors and heat pump systems. A comparison of operating costs for heat pump and gas, oil, and coal-fired heating systems is given for four cities.

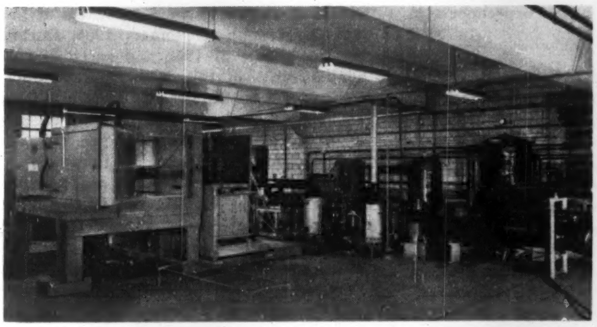


Fig. 5 — General view of human calorimeter and plate meters with associated heat exchangers, tanks and controls

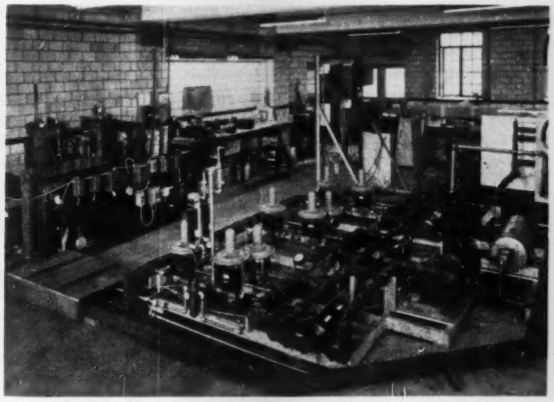


Fig. 6 — Plate meter and saturator control equipment for respiratory circuit

Heating Load

Suitability of Helium as a Tracer Gas for Infiltration Studies (U. S. Bureau of Standards): Some time ago it was proposed that infiltration be studied by releasing a small amount of helium in a space and measuring its rate of decay. A gas analyzer for determining the concentration of helium was purchased by the Laboratory, but the TAC on Heating Load suggested that the feasibility of both method and instrument be demonstrated under carefully controlled conditions before field tests were attempted. The analyzer was therefore sent to the National Bureau of Standards where it was used for studying infiltration in the Test Bungalow.

Tests completed early in 1953 indicated that satisfactory results could be obtained with the instrument, and a complete report on its use was submitted. The instrument was then shipped to the University of Illinois for use in field testing.

Study of Infiltration in a Residence Using the Tracer Gas Technique (University of Illinois): Under a new cooperative research agreement with the University of Illinois, a study of infiltration is being made in the Warm Air Research Residence No. 2. Infiltration rates will be determined by the tracer gas technique, using a helium analyzer loaned to the school by the Research Laboratory. It is estimated that the installation of equipment will be completed by the middle of January and that tests in Residence No. 2 will be completed by the spring of 1954. Tests will be made under a variety of wind and weather conditions.

Guide Revisions: The TAC on Heating Load prepared revisions for Chapter 12 of THE GUIDE 1954.

Hot Water and Steam Heating

Noise in Piping Systems (Northwestern University): This cooperative research project was activated in 1951. A paper, Experimental Approaches to the Study of Noise and Noise Transmission in Piping Systems, by W. L. Rogers, describing the experimental apparatus and instrumentation was presented at the Semi-Annual Meeting in Denver in 1953.

To date, all tests have been made with 20-ft test lengths of ¾-in. pipe. Other pipe sizes and lengths will be used, with water velocity, temperature and pressure as additional variables.

The Metastable State of Water as a Possible Cause of Boiler Explosions (Northwestern University): Initial work on this project was concerned with demonstrating the metastable state in as many ways as possible. It was easy to show its existence in glass and, by a gradual reduction in pressure, it could be produced in a metal container. Although normal conditions reestablished themselves with considerable violence, the pressure impulses in the small vessels used up to now have been of small magnitude.

A larger tank is now being prepared to determine if the pressure surges will increase with an increase in the size of the vessel. If this is found to be the case, tests will be made in actual boilers.

Air Entrainment in Hot Water Heating Systems (University of Florida): Under a cooperative research agreement with the University of Florida, studies are being made on the effects of air or gases on the operation of hot water heating systems. The relationship between water velocity and air entrainment, and methods of air elimination are the subjects currently being investigated.

Human Calorimetry

In 1948 the Office of Naval Research requested the Society's Laboratory to attempt to design and construct a human calorimeter which would have high accuracy and rapid response. A contract for this work was signed in June of that year, and work on the project has been continuously in progress since that time.

The calorimeter as originally contemplated was essentially completed about a year ago, but the ONR requested that additional equipment be incorporated to permit the independent measurement of the heat exchange which takes place in the respiratory tract.

This additional equipment was completed, and enough tests were made to determine the operating characteristics of the complete assembly. The apparatus was then dismantled, and was shipped to the *Naval Medical Research Institute* at Bethesda, Md., the latter part of December, 1953.

R. G. Huebscher, who had charge of the design and construction of the equipment, will be at the Institute for approximately six months to supervise the assembly of the calorimeter and put it in operation.

Industrial Environment

Design of Local Exhaust Ventilation for Hot Industrial Processes (University of Pittsburgh): Any hot process creates a definite pattern of air flow by convection, the magnitude of which is related to the rate of heat release. The objective of a cooperative research project with the University of Pittsburgh is to relate the volume and pattern of this convection flow with the rate of heat release, surface temperature, and physical dimensions of the hot body, and to further determine the relation between convection flow and exhaust ventilation requirements for canopy and lateral hoods.

Originally hope was that the convection flow created by the hot body could be measured directly. A considerable amount of work was done toward this end. It was found, however, that the convected stream was so turbulent and unstable that reproducible results were unobtainable.

Recent investigations have been made to directly determine the amount of exhaust ventilation required at various distances above the hot body to capture convected air. Tests have been made for both canopy and lateral hoods of various dimensions, and with heated cylinders of various sizes having various rates of heat release.

Results to date indicate that for a canopy type hood at a given height, ventilation air requirements increase with an increase in heat release and with a decrease in hood diameter. For lateral type hoods, air requirements increase with an increase in heat release and a decrease in height of the hood opening. For a given rate of heat release, surface temperature seems to have no effect.

Guide Revisions

The TAC on Industrial Environment has prepared a major revision for one chapter and minor revisions for four chapters of THE GUIDE 1954.

Insulation

Thermal Properties of Building and Insulating Materials: Under the guidance of the TAC on Insulation, members of the Laboratory Staff are making a complete review and analysis of the thermal properties of building and insulating materials. Immediate objectives of this long range program are to revise and improve data in THE GUIDE, and to develop an improved form for their presentation.

Laboratory test data on insulating materials have been requested from a number of insulation manufacturers and trade associations. A number of these have submitted the desired data while others are having new tests made. It is expected that the collection of these data will be completed by early spring, and that the Laboratory Staff and the Committee can start their compilation by that time.

Measurement of Moisture Permeance (Pennsylvania State College): Under a cooperative research contract with the Society, an instrument was developed at The Pennsylvania State College for rapid measurement of water vapor permeance of thin materials of the type commonly used for vapor barriers. The work was completed in 1952, and a paper, Automatic Permeance Testing by the Permeometer, by F. A. Joy and A. W. Sherdon, was presented at the Semi-Annual Meeting in Denver.

Odors

The installation of the air conditioning equipment for the odor test rooms in the Laboratory was completed during the year. Tests have been made that prove the equipment can independently maintain the desired temperature and relative humidity of each room.

Because of the staff shortage, it has been impossible to get the odor test program under way, but hope persists the right leader for this project will soon be found. A series of tests to determine effects of temperature and relative humidity on odor perception will be the first experiments in the rooms.

Odor Correlation Conference

On April 23-24, 1953, a Basic Odor Research Correlation Conference was held at the Barbizon Plaza Hotel in New York City, under the joint sponsorship of the ASHVE and the *New York Academy of Sciences.* Much of the organizational work for this conference was done by the members of the TAC on Odors.

The many papers presented at the conference reported on a great variety of research being done on odors by universities, industrial organizations, and government agencies. The conference was attended by 324 persons vitally interested in some phase of the odor problem.

Proceedings of the conference will be published in the near future by the *New York Academy of Sciences* (see report in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, June 1953, pp. 129-131).

Panel Heating and Cooling

Group A: To supplement and check the results of earlier tests, two additional plaster panels were constructed and tested at the Laboratory. Both panels had ⅜-in. I. D. non-ferrous tubes located below metal lath on 4-in. centers, with the lath and tubes tightly tied together at 8 in. intervals. Special care was taken in plastering one of the panels to obtain unusually good tube embedment; while on the second panel tube embedment was poorer than normal.

Results of tests on the two panels gave an indication of range in panel output which might be expected due to variations in tube embedment. A previously tested panel of similar construction had average tube embedment, but the tubes and lath had not been wired together. It was, therefore, possible to determine the effect of good or poor contact between the tubes and metal lath by comparing results obtained on the original and recent panels.

Data contained in the paper, Further Studies of the Thermal Characteristics of Plaster Panels, by L. F. Schutrum and C. M. Humphreys, presented at the Semi-Annual Meeting in Denver, indicate that good tube embedment and good contact between tubes and metal lath are both important.

Data on heat flow in a concrete floor panel laid on the ground with tubes at the slab-earth interface, were given in a paper presented by title at the 1953 Semi-Annual Meeting. Data for the paper were determined at the Laboratory by means of an electrolytic type analogue.

Group B: Early in 1952, a series of tests was made in the Environment Laboratory to study heat exchanges in a ceiling panel heated room. Tests were made in an empty room with the four walls and floor maintained at a uniform temperature. The results of this work were presented at the Annual Meeting in January 1953. During the latter part of 1952 and early 1953, a similar series of tests with similar limitations in test conditions was made in a floor panel heated space. The findings of this series were reported in a paper given at the Semi-Annual Meeting in Denver.

These original tests were made under idealized conditions. At the 1954 Annual Meeting, a paper was presented on the modifying effects of non-uniform environment and room furnishings. This paper showed that heat output of a floor or ceiling panel, and the resulting room air temperature, are essentially the same for a non-uniform environment as for a uniform environment having the same average unheated surface temperature. It also indicates that the effect of room furnishings can be neglected without serious error.

This paper also contains information on effects of various combinations of three types of carpets and two types of carpet padding on the heat output of a floor panel. With one of the combinations tested, to obtain a panel output of 25 Btu/(hr) (sq ft) the temperature of the panel surface would have to be approximately 60 deg higher than for the bare panel.

Tests to determine the effect of room size, and the effect of heating only a part of the floor or ceiling area are now nearing completion, and a paper on this work should be available in the near future.

Another series of tests will soon be started to determine the radiation and convection components of the heat exchanges taking place in a panel heated space. A radiometer was purchased for this purpose some time ago, and since its purchase it has been used to measure the emissivity of the panel surfaces of the Environment Laboratory, the globe thermometer, the slats used in the glass shading studies, and the surfaces of the roof sections used in the study of periodic heat flow through roofs.

With the completion of these tests, sufficient information should be at hand to permit drafting a simplified design procedure. A special subcommittee of the TAC on Panel Heating and Cooling has been appointed to work with members of the Laboratory Staff on this next important step. It is expected that a design procedure, based on results of Laboratory studies, will be published during 1954.

The next major step in the experimental program under *Group B* will be the study of panel cooling. At its last meeting the Committee outlined the first phase of the panel cooling program, and this should be started soon. Piping circuits for the Environment Laboratory have already been changed to permit heating of the walls for the panel cooling studies.

Group D: Under a Research Fellowship established at the University of Minnesota, field studies were made during the 1951-52 heating season to develop information on the control of floor panel heating systems. The three installations studied included a single-story office building and a factory building, both in Milwaukee, and a residence in Minneapolis. A paper covering the first year's work was presented at the 1953 Annual Meeting.

During the summer of 1952, certain changes were made in the panel systems or their controls, and tests were repeated during the 1952-53 heating season. A paper giving the results of these later tests, Field Studies of Floor Panel Control Systems, Part II, by A. B. Algren, E. F. Snyder, Jr., and R. R. Head, was presented at the Annual Meeting in Houston.

Physiological Research

Physiological Research (University of Illinois Medical School): Under a cooperative research program, supported jointly by the U. S. Public Health Service and the Society, a study was made of the physiological responses of obese, hypothyroid, and hyperthyroid patients to sudden changes in environment. This program has been completed, and a paper giving the results of the study is tentatively scheduled for presentation at the next Semi-Annual Meeting.

Plant and Animal Husbandry

Role of Air Conditioning in Plant Growth (California Institute of Technology): A study of the effect of air conditioning on plant growth was made at the Earhart Plant Research Laboratory of the California Institute of Technology, under a cooperative research agreement with the Society. Most of the work was done with tomato plants. The importance of both day and night temperatures was demonstrated, and possible increases of several hundred percent in the yield were indicated. A paper, The Effect of Air Conditioning on Plant Growth, by F. W. Went, was presented at the Annual Meeting in Houston.

Sorption

Dynamic Characteristics of a Solid Adsorbent (Pennsylvania State College): This project is being carried on under a cooperative agreement with the Society. A literature survey on the subject has been completed and both experimental and analytical studies are under way.

Methods of Testing Sorption Type Dehumidifiers: The TAC on Sorption has continued in its efforts to devise suitable methods of testing sorption type dehumidifiers.

Sound and Vibration Control

Classification of Research Problems on Sound and Vibration: The TAC on Sound and Vibration accepted, with slight modification, the outline of research problems recommended by the Engineering Sub-Committee of *NAFM*. The first problem in the outline relates to instrumentation, and the TAC is now developing a paper on this subject.

Weather Data

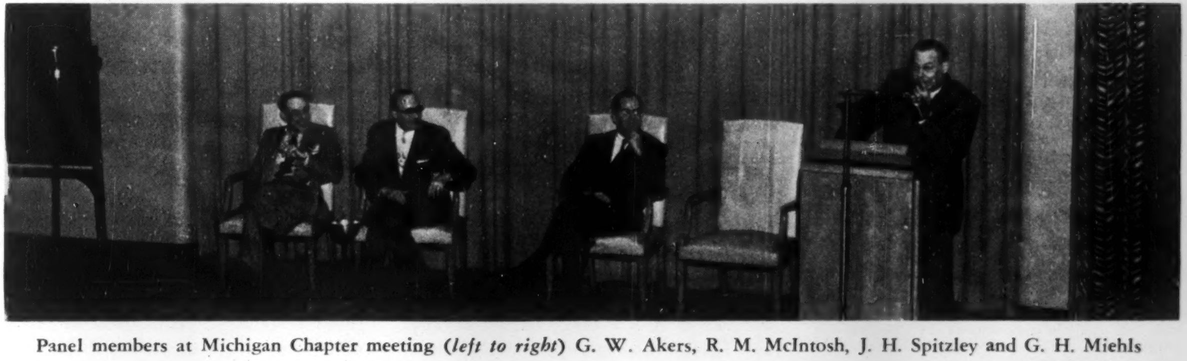
A new TAC on Weather Data was appointed during the year and held its organization meeting at the Semi Annual Meeting in Denver. This Committee plans to confine its activities to the development of comprehensive weather data, and believes that the recommendation of design temperatures is more properly a function of the TA Committees on Heating Load and Cooling Load.

Panel Groups Discuss Rapport Between Profession & Industry

Shortly after opening the February meeting of the Michigan Chapter, Pres. R. H. Oberschulte concluded the regular business of the Chapter and turned the session over to E. F. Glanz, vice president and program chairman. Mr. Glanz announced that he would be moderator for two panel groups which would give both sides of two issues, important to the profession and industry. He mentioned the topics for discussion and introduced the speakers.

G. H. Miehls, president of Albert Kahn Associated Architects and Engineers, Inc., took the architect's side in *Effective Methods of Improving Relations between Consulting Engineers and Contractors.* J. H. Spitzley, president, R. L. Spitzley Heating Co., stated the contractor's viewpoint. Mr. Miehl believes it is the architect engineer's task to supervise a job, not the contractor's. His task is to plan, the contractor's to execute. According to Mr. Miehl, the contractor is out of hand if he offers substitutes for specified equipment. He should advise the architect regarding time required for installation, and give him the benefit of his experience with different makes of equipment.

Mr. Spitzley doesn't think a contractor should be held responsible for everything written in, or withheld from, the specifications. He should see to it that sufficient amounts of nails, plaster, paint, and small fittings are used, but equipment requiring major installation procedures, such as heating and ventilating facilities and piping, is up to the architect. The architect is the



Panel members at Michigan Chapter meeting (*left to right*) G. W. Akers, R. M. McIntosh, J. H. Spitzley and G. H. Miehls person with the time and personnel to check all details.

Regarding *Effective Methods of Improving Relations between Consulting Engineers and Manufacturer's Representatives,* R. M. McIntosh's theory is that the consulting engineer could do more and better work if he didn't lose so much time from routine calls by the manufacturer's representative. He believes the representative should visit only the engineer responsible for job completion, and that he could solve many perplexing problems that arise in representative-engineer relations and also save time, by telephoning instead of making a personal call.

G. W. Akers, president, G. W. Akers Company, took the viewpoint that the consulting engineer should take advantage of the representative's knowledge and skill and use more, not less, time in interviews with him. The representative's contacts with factory management and engineering meetings make him a well-rounded advisor. Keeping friendly relations with the representative insures his cooperation in securing prompt delivery of specified equipment. Attendance 230.

Summary of Chapter Meetings*

• *ARKANSAS*: The February meeting of the Arkansas chapter was called to order by Pres. R. E. Blaylock at the Sam Peck Hotel.

President Blaylock called upon the following committee chairmen to give their reports: Attendance — W. A. Bullard; Entertainment — J. C. Lewis; Legislative — Herman Cumnock; Membership — K. A. Pettit; Program — W. J. Franklin, and Publicity — R. H. Combs.

W. J. Franklin introduced the guest speaker, Stanley Gray. Mr. Gray is regional commercial controls manager for Minneapolis-Honeywell Regulator Co. *The Fundamentals of Electronics and the Application of Electronics to Temperature Controls* was the title of his subject which was illustrated by slides. Attendance 36. Attendance ratio 0.35.

• *BALTIMORE*: Pres. H. D. Glaser called the February meeting to order and reported on the Annual Meeting.

M. V. Eusey, Jr., introduced the guest speaker Z. A. Marsh, school house market control supervisor of Minneapolis-Honeywell Regulator Co. The topic of Mr. Marsh's discussion was entitled *The Role of Electronics in Air Conditioning.* Mr. Marsh, with the aid of slides, gave a very interesting talk, pointing out the advancement in control devices. The new controls are extremely sensitive to temperature and humidity and can control the required conditions to within very close tolerances. The control of humidity is very important in many manufacturing processes and plays an invaluable part as an aid to health. Attendance 31. Attendance ratio 0.29.

• *BRITISH COLUMBIA*: Twenty-eight members and six guests attended the February meeting, Pres. C. W. Leek presiding.

R. B. McDonell, chairman of the By-Laws Committee reported that the Chapter By-Laws had been approved by the Council with minor revisions.

M. E. Adams, A. C. Martin, R. B. McDonell, D. W. Thomson, and E. H. Norton, appointed by the Board of Governors as the Nominating Committee, were approved by the membership. G. M. Dahl, J. C. Thompson, and R. C. Tufts were appointed as an Auditing Committee.

S. C. Dales made a report on the Annual Meeting in Houston, Tex., emphasizing the recommendations of the Chapters Conference Committee. The members went on record as approving the Committee's plans.

President Leek introduced the guest speaker, P. W. Barchard, assistant manager of the British Columbia Electric Gas Division. His talk, *The Natural Gas Story*, was interesting and instructive. Mr. Barchard stated in his opening remarks that there is a natural gas reserve in the United States of 199.7 trillion cu ft located in a few large fields, mainly in Texas, Kansas, and Oklahoma. Canadian reserves now total about 13 trillion cu ft, with a potential estimated from 25 to 140 trillion cu ft. Alberta, B. C., and Saskatchewan are the gas producing fields in the Dominion.

Developments in pipe line procedure from the low-carbon steel lap-welded pipe used in the 1920's were traced by the speaker. Today's high-carbon seamless steel pipe can transmit 500 million cu ft of gas daily. Storage methods, load factors and financing were detailed in their importance to transmission of natural gas over long distance. British Columbia's interest in natural gas began in 1946 with the desire of the British Columbia Electric Co., for an adequate supply. Reasons for the F.P.C. hearings and their expected results were explained; also their significance to the Canadian natural gas story. Attendance 34. Attendance ratio 0.45.

• *CENTRAL NEW YORK*: Pres. C. R. Acheson called the January meeting to order at the University Club of Syracuse. A report was presented by President Acheson concerning the Chapter's treasury, and the minutes of the previous meeting were read and approved.

The speaker of the evening, introduced by R. L. Manier, was T. C. Moran, general superintendent, gas operations, Niagara-Mohawk Power Corp. Mr. Moran discussed production at well locations and future resources; transmission lines and compressor stations, their locations and sizes; Central New York distribution; use of old wells for storage during low demand season; and pressure reducing stations. Attendance 40. Attendance ratio 0.24.

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*Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

• *CONNECTICUT*: Pres. G. F. Nieske called the February meeting to order by reading the minutes of the previous meeting. C. L. L'Hommedieu, treasurer, reported on the Chapter's financial status. Carl Wahnquist, Jr. announced the names of two new members to the Chapter, and R. B. Sweet, Meetings Committee chairman, reported on the future meetings and the speakers for these meetings.

Floyd Hasselriis, application engineer of the American Hydrotherm Co., presented an interesting talk entitled *High Temperature Water Heat Distribution Systems*. Attendance 52.

• *CONNECTICUT*: The January meeting was called to order by Pres. G. F. Nieske at the Three Cups Inn, and the minutes of the previous meeting were read and approved. C. L. L'Hommedieu, vice president and treasurer, reported on the Chapter's financial status.

J. D. Pierce presented a report from the Meetings Committee; Carl Wahnquist, Jr. gave a brief account on the progress of the Membership Committee; and T. L. Arnold, chairman of the By-Laws Committee, discussed recommended revisions to the By-Laws. Attendance 62.

• *DELTA*: The January meeting was called to order by Pres. H. L. Salaun at the Engineers' Club.

Society Pres. Reg. F. Taylor was the guest speaker at the meeting and his subject was entitled *Some Unusual Situations Encountered in Air Conditioning Design*. Slides were shown of the air-to-air heat pump operated by a natural gas engine which is used to air condition President Taylor's home.

O. F. Schully, membership chairman, reported on the membership drive, which has been very successful, and the new members were introduced. Attendance 84. Attendance ratio 0.40.

• *EMPIRE STATE*: Pres. N. W. Burrill called the meeting to order at Panetta's Restaurant. A special report on plans for Ladies Night was made by Harry Horowitz, chairman.

G. G. Davis introduced the guest speaker, Charles Kawecki of the State Architect's office. Mr. Kawecki discussed the duties and responsibilities of the State Architect's organization of 550 people and his presentation was interesting and informative. Attendance 30. Attendance ratio 0.37.

• *GOLDEN GATE*: The February meeting was opened by Pres. J. E. Murray reading the minutes of the previous meeting. These were approved as read.

Jack Beckett, chief engineer, Wesix Electric Heater Co., San Francisco, Calif., was the guest speaker. Mr. Beckett presented an exceedingly interesting talk on the subject *Ionization as an Environment Factor*.

President Murray presented H. C. Murphy with a Life Membership Certificate and Mr. Murphy responded with a short speech. Attendance 65. Attendance ratio 0.25.

• *ILLINOIS*: Pres. H. G. Chapin presided at the February meeting. John W. James, Society second vice president, and G. W. Bornquist, chairman of the Chapters Conference Committee, reported on the Annual Meeting.

D. M. Valentine, Kathabar Division, Surface Combustion Corp., was introduced by E. R. Gritschke. Mr. Valentine discussed the application of chemical dehumidification equipment for humidity control. He pointed out that when low dry bulb temperature, as well as low dew point, is important, liquid dehumidification has particular advantages.

O. W. Morgan, supervisor, Application Engineering, Worthington Corp., outlined special performance characteristics of refrigeration equipment, noting its limitations as well as advantages. With such equipment, dry bulb temperatures as well as humidities are often made so low that reheating is necessary to obtain proper dry bulb conditions. Attendance 134.

• *INLAND EMPIRE*: J. E. Hutsinpiller introduced the speaker of the evening, Frank Fairfield of Carrier Corp., who presented a talk on *Air Conditioning for the Residence*.

Pres. G. M. Dieter presided and reports were received from Max Tonn, treasurer, H. A. Bickel, Chapters Conference Committee member, and R. B. Campbell, Attendance Committee chairman. A Nominating Committee was appointed by President Dieter as follows: L. E. Marque, T. P. Nau, K. M. Wood, E. W. Bunnell and G. M. Dieter, and was requested to submit candidates at the March meeting. Attendance 32.

• *IOWA*: The February meeting was a joint meeting with the Iowa State College Branch of the *ASME* in the Oak Room of the Memorial Union, Ames, Ia.

George Frost, president of the *ASME* called the meeting to order and introduced the officers of the two societies.

D. W. Lynch, manager of engineering, Weathertron Department of the Air Conditioning Division of the General Electric Co., Bloomfield, N. J., was the guest speaker for the evening. Mr. Lynch discussed the design and development of heat pumps for the home and commercial market. With the aid of slides, he compared the performance of the heat pump with conventional heating and cooling equipment, pointing out the requirements which were to be met if the heat pump was to be competitive in the heating and air conditioning industries. Attendance 40.

• *KANSAS CITY*: J. A. Cable, application engineer, Centrifugal Pump Section, Allis Chalmers Mfg. Co., Norwood, Ohio, was the guest speaker at the February meeting. *Application and Selection of Centrifugal Pumps* was the title of Mr. Cable's talk which was illustrated by slides.

Pres. G. H. Stoffer called the meeting to order at the Wishbone Restaurant and read the minutes of the last meeting. E. K. Campbell reported the passing of L. W. Millis, a Life Member of the Society, and the sympathy of the Chapter was expressed by President Stoffer.

President Stoffer, F. K. Ladewig and A. S. Hurt, Jr. gave a brief account regarding the Annual Meeting at Houston. Attendance 95. Attendance ratio 0.30.

• *MANITOBA*: Pres. A. K. Piercy called the January meeting to order at the Fort Garry Hotel and thanked the Entertainment Committee for its splendid cooperation and work in making the Christmas party such a success.

G. T. Christie presented the guest speaker, W. Ward, who presented a very interesting discussion entitled *Industrial Hygiene and Ventilation*. Attendance 16.

• *MASSACHUSETTS*: Pres. A. L. Hare, member of the Society's Chapters Conference Committee, called the February meeting to order and reported on the Annual Meeting. D. W. Blair, By-Laws Committee chairman, reported that the new Chapter By-Laws were approved by the Council with some slight changes and would be ready for submission to the Chapter for approval at the March meeting.

A Nominating Committee composed of the following members was elected: W. G. Martin, Jr., W. G. Burbo, M. I. Kishler, C. H. Dow and D. M. Archer.

O. D. Colvin, president of Cargocaire Engineering Corp., New York, N. Y., presented an interesting discussion on the problems in cargo conditioning, and the care of cargoes and ships on extended cruises. Attendance 55.

• *MASSACHUSETTS*: The January meeting was called to order by Pres. A. L. Hare at the Faculty Club at MIT. President Hare then presented D. W. Blair, chairman of the By-Laws Committee, who gave a report on the activities of his committee.

The business meeting was followed by a conducted tour of the Digital Computer Laboratory of MIT. Prior to the tour Mr. Cafflin and Dr. H. M. Denman of the Digital Computer Laboratory gave a short description of the operation and purposes of the laboratory using slides to illustrate. Although not in the heating and ventilating field the subject was of extreme interest from the standpoint of future uses of this type of equipment. The laboratory personnel were very cooperative in answering questions and the Chapter felt greatly indebted to G. W. Sprague for arranging such an interesting tour. Attendance 62.

• *MICHIGAN*: For the 24th consecutive year, the Michigan Chapter was the guest of the Central Heating Division of the Detroit Edison Co. Pres. R. H. Oberschulte called the meeting to order and read a letter of appreciation addressed to E. E. Dubry, general superintendent of central heating, Detroit Edison Co.

Following a very excellent dinner, Mr. Dubry introduced the guest speaker of the evening, A. S. Griswold, assistant to the president, Detroit Edison Co. Mr. Griswold's discussion focused upon *Problems of Nuclear Power*. He is active in the Dow Chemical-Detroit Edison Nuclear Power Project and showed a film *A is for Atom* which gave a simplified explanation of atomic energy. He limited his talk to the possibility of using nuclear power for the generation of electric power or steam and then discussed the problems involved in three main categories: technical; economic; and legal and governmental.

Mr. Griswold explained that in addition to Dow Chemical Co. and Detroit Edison Co., 14 other electric power companies, four manufacturing companies, and several engineering firms are contributing to the Nuclear Power Research Project and that a total of 2½ million dollars will be invested by these companies. This sum of money is being spent for research to determine whether the use of atomic energy is economically feasible for power generation. At the present time, because of government regulations, there is no way which this investment could be used for the direct benefit of the companies involved. Mr. Griswold suggested that there would be more progress if this work were done on a competitive basis by equipment manufacturers, power companies, etc. He further pointed out that in connection with generation of electric power, an investment of $227.00 per kwh could be made in a nuclear power plant and still be competitive with the present investment of $27.00 per kwh for power plants using coal due to the saving in fuel and labor. Several slides were shown to illustrate the various points brought out by the speaker. Attendance 325. Attendance ratio 0.68.

• *MINNESOTA*: W. P. Chapman, sales engineer, National Tube Division, U. S. Steel Corp., discussed snow melting systems and described methods of calculating heating load, power requirement for circulating the heating medium, and permanence of such systems.

Vice Pres. J. A. Craig called the meeting to order in the absence of V. E. Pearson, and announced that M. S. Wunderlich had been honored at the Annual Meeting by his election to serve as chairman of the Society's Nominating Committee.

A long discussion was held on the future status and desirability of maintaining the *Minnesota Exchanger*. It was suggested the paper be kept small to reduce the cost and work involved in producing it. Almost all the members read the publication from beginning to end; a motion was made and carried that the paper be published in its present form. Attendance 115.

• *MISSISSIPPI*: D. M. Mills, member of Council and manager of the Houston Division of F. J. Evans Engineering Co., was guest speaker at the February meeting. He reviewed some of the highlights of the Annual Meeting and then gave an interesting presentation of the development of the heating industry and the part played by natural gas.

Pres. I. E. Rowe chairmanned the meeting and Treas. T. E. Stepan reported on the financial condition of the Chapter. Program Committee Chairman J. W. Taylor introduced Mr. Mills. Attendance 35.

• *MONTREAL*: Pres. B. J. Horsburgh called the meeting to order in the Windsor Station Restaurant on January 18. J. G. Chenevert, a chapter past president, presented $25.00 and a gift order of the HEATING VENTILATING AIR CONDITIONING GUIDE 1953 to W. G. McCrudden. This was his reward for the prize-winning essay, *Heating and Ventilating of the General Hospital Clinic at St. Catherine, Ont.*, judged the best essay by a member of the 1953 graduating class of McGill University.

After a short recess, H. G. Murray took charge and became moderator for a panel discussion on *Causes and Possible Prevention of Freezing of Air Heating Coils* by Robert Clapperton, W. J. Robinson, D. Preston, Allen Hutchinson, and R. Bilodeau. An abundance of informative material presented by a capable and experienced group and soundly summarized by D. L. Lindsay added up to an instructive and entertaining session. He closed the meeting with an invitation for guests present to become members of Montreal Chapter ASHVE.

• *NEW YORK*: L. D. Carr, program committee, introduced the speaker of the evening, G. F. Landgraf, vice president, Trion, Inc., McKees Rocks, Pa. Mr. Landgraf spoke on the subject, *Electrostatic Air Filters*. He traced the development of the electrostatic type of filter and also demonstrated an air sampling device for evaluating filter performance. This instrument was based upon the work of R. S. Dill at the National Bureau of Standards. Mr. Landgraf's talk proved to be one of great interest and a lively discussion period followed.

Pres. J. E. Schechter called the January meeting to order and the minutes of the past meeting were approved as read. F. A. Fideli, membership chairman, introduced six new members after which the meeting was adjourned. Attendance 75. Attendance ratio 0.13.

• *NEW YORK*: Pres. J. E. Schechter called the February meeting to order at the Building Trades Club. The minutes of the previous meeting were read and approved after which President Schechter presented A. A. Bearman, chairman of the Nominating Committee. Mr. Bearman reported on the coming election and presented a slate of officers for the year ending May 31, 1955.

R. L. Stinard, program chairman introduced D. C. McCoy of General Sales — Frigidaire Division, General Motors Corp., Dayton, Ohio. Mr. McCoy discussed *Air Conditioning in Your Automobile* and a lively discussion period followed his interesting talk. Attendance 50. Attendance ratio 0.11.

• *NORTH TEXAS*: Pres. M. W. Brown called the February meeting to order at the Melrose Hotel by reading the minutes of the previous meeting. President Brown announced that Reg. F. Taylor had been elected a Life Member of the North Texas Chapter.

W. E. Lind, ARA Mfg. Co., Fort Worth, Tex., was introduced by Ross Zumwalt. Mr. Lind gave a very interesting discussion on automobile air conditioning, illustrated by slides. Attendance 91. Attendance ratio 0.40.

• *OKLAHOMA*: Pres. F. X. Loeffler, Jr. called the meeting to order. He presented a past president's pin to W. J. Collins, Jr. Mr. Collins, who served as president of the Chapter during the 1952-53 season, was commended for his untiring efforts in the promotion of Chapter and Society welfare.

H. H. Korff, Chicago district field engineer, Johnson Service Co., Chicago, Ill., was the guest speaker of the evening. Mr. Korff brought to the attention of the Chapter the necessity for adequate controls on variable volume systems, both air and water. The advantage of velocity regulators as compared to static pressure regulators was discussed and their use recommended. It was explained that by the use of such devices the demands made on room thermostats are lessened and better control of room temperatures results. Mr. Korff's presentation was very instructive and informative. Attendance 58. Attendance ratio 0.52.

• *OTTAWA VALLEY*: The January meeting was held at the Prescott Hotel and was opened by Pres. G. L. Ostiguy. The minutes of the previous meeting were read and approved.

A panel discussion was held on the practice of contractors and subcontractors openly bidding against each other. A very lively discussion then ensued and many opinions were given on how to prevent this practice. Among those mentioned were closer specifications, naming of sub-contractors and suppliers of equipment on tenders, and measures to stop the practice of the owner trying to induce the general contractor to lower his bid. The panel consisted of members of the Chapter, and their comments and ideas on this subject proved very valuable. Attendance 22. Attendance ratio 0.50.

• *PHILADELPHIA*: Shortly after opening the meeting in the Engineers Club, February 11, Pres. C. F. Dietz introduced Executive Secretary A. V. Hutchinson. Mr. Hutchinson discussed highlights of the Society's 60th Annual Meeting in Houston, Tex., and briefly dwelled on his hopes for the 1955 Annual Meeting in Philadelphia.

M. F. Blankin spoke about Engineers' Week, February 21 through 27, sponsored by the *Pennsylvania Society of Professional Engineers*. J. W. McElgin, general chairman of the Committee on Arrangements for the 61st Annual Meeting in Philadelphia, announced his appointments for chairmen of several committees.

A. M. Robertson introduced J. M. Kane, American Air Filter Co., Louisville, Ky., the speaker of the evening.

Mr. Kane was in excellent form and gave an interesting dissertation on *Local Exhaust Ventilation and Air Cleaning Equipment Needed to Control Pollution of Indoor and Outside Air.* Lantern slides and movies were used to emphasize important aspects of his lecture. He held a short question and answer period following his talk. Attendance 92.

• *PITTSBURGH*: Pres. C. H. Schneider called the February meeting to order, and J. W. Frazier gave the only report of the evening, its text being that the new Roster would be ready for March mailing. President Schneider appointed a Nominating Committee as follows: B. B. Reilly, chairman, A. F. Metzger and W. D. Simpson.

E. C. Hach introduced the speaker of the evening, C. M. Wilson, general sales manager, The Anemostat Corp. of America, New York, N. Y., who discussed *Fundamentals of High Velocity Air Distribution.* His remarks were punctuated with lantern slide illustrations. He described high pressure system nozzles which produce high velocity air jets without objectionable noises. Fan power is reasonable for the small ducts and consequently small pipes can be used and run in chases or furred in at columns along water lines. At the conclusion of his talk, Mr. Wilson answered questions with the aid of a scale model of a high pressure system. Attendance 85.

• *PITTSBURGH*: Pres. C. H. Schneider called the January meeting to order at the Sheraton Hotel.

E. C. Hach introduced the speaker of the evening, Dr. T. P. May, International Nickel Co., consultant on corrosion. His topic for discussion was entitled *Corrosion in Action.* Mr. May's discussion centered around the showing of a color film, divided into three parts. The first part was about the *Nature of Corrosion and the Anode and Cathode Process,* which showed several forms of corrosion which yearly destroy more than six billion dollars in structures; it also showed the electro-chemical nature of corrosion and demonstrated what happens at the anode and cathode areas during passage of corrosion currents. The effects oxygen has in corrosion were also demonstrated. The second film was entitled the *Origin and Characteristics of Corrosion Currents.* This dealt with galvanic corrosion, the difference in potential and current density on corrosion rates, and the effect of velocity on corrosion rates, as well as revealing the location of anodes and cathodes in corrosion. The third film was on passivity and protective films, and showed a protective film formed on iron in nitric acid which prevented deposition of copper from copper sulphate. Between films, Dr. May spoke of the time element involved in making these films, and also the difficulty in maintaining enough light and time to piece the film together. This was one of the most entertaining and interesting meetings of the Pittsburgh Chapter, and Dr. May was given a hearty round of applause for his fine presentation. Attendance 48.

• *SACRAMENTO VALLEY*: Pres. E. C. McKinsey called the January meeting to order and read the minutes of the previous meeting which were approved.

Reports were presented by the chairmen of the Membership, Research, Program and Finance Committees after which Prof. Edwin Weinberg of the technical education department of the Sacramento State College was introduced by J. E. Marshall.

Professor Weinberg stated that the present engineering course offered at Sacramento State College was the result of an investigation conducted by himself and other college teachers. The investigation indicated that great demand existed in the Sacramento area for people trained in the applied sciences and practical engineering rather than highly technical personnel. As a result the College is offering an engineering course aimed at satisfying this demand, leaving instruction in the higher technical sciences to the state universities. Attendance 48. Attendance ratio 0.44.

• *SOUTHERN CALIFORNIA*: Pres. L. B. Davenport called the meeting to order by reporting on the Annual Meeting of the Society at Houston. He was enthusiastic about the manner in which the meeting was conducted and his report was most favorable.

The minutes of the previous meeting were read and approved after which the guest speaker, I. P. Fulmor, president, Air Conditioning Co., Southern California, was introduced. He presented a very entertaining talk entitled *The Transpacific Yacht Race of* 1953 *from Los Angeles to Honolulu, Hawaii.* Attendance 84.

• *SOUTHERN PIEDMONT*: J. A. Marshall, regional manager, Commercial Division, Minneapolis-Honeywell Regulator Co., Atlanta, Ga., was the guest speaker at the January meeting. Mr. Marshall gave a talk on *Electronic Controls* and illustrated his talk with projector slides and a color movie. His talk was very well received and a lively discussion session ensued.

Pres. R. E. Mason called the meeting to order and called upon W. E. Stowe, Jr. to report on the Chapter's financial status.

R. O. McGary, Nominating Committee chairman, submitted the following slate of officers for the 1954 season: *President* — R. S. Fullerton; *Vice-President* — L. F. Lawrence, Jr.; *Secretary* — J. R. Clark, and *Treasurer* — C. M. Setzer, Jr. These men were unanimously elected after which the meeting was adjourned. Attendance 39.

• *WASHINGTON, D. C.*: L. G. Humphrey, meeting chairman, introduced the guest speaker, C. A. Scarlott, editor of the *Westinghouse Engineer.* Mr. Scarlott's subject was entitled *Highlights in Engineering Progress.* He talked of the smallest and the largest developments by Westinghouse and also discussed the first nuclear power plant and the new atomic submarine, the Nautilus. His talk was very interesting and unusual.

Pres. J. G. Muirheid called the meeting to order by introducing the members of the Baltimore Chapter who were the guests of the Washington Chapter. Attendance 133. Attendance ratio 0.60.

• *WASHINGTON, D. C.*: L. J. LaTart, Research Associate, Revere Copper and Brass Co., Rome, N. Y., whose subject for discussion was entitled *The Practical Aspects of Panel Heating*, was the guest speaker at the December meeting. Mr. LaTart approached this subject with simplicity and lack of bias. Although his personal preference appears to be for ceiling panels, he brought out that the heat transfer rate from floor panels is 50 percent greater than from ceiling panels. He further stressed the importance of embedding the tubing deep into the plaster in order to obtain the proper heat flow through the material. He particularly noted three ways to control the rate of heat transfer: 1—by varying the water temperature; 2—by varying the tube spacing over the entire floor or ceiling; and 3—by constant spacing and water temperature, but varying the panel area. As to coil design, he urged rectangular shapes for simplicity and reasonable cost, and common supply and return lines with coils of even resistance. Mr. LaTart then showed a number of slides of ⅜-in. tubing in ceilings, some above the metal lath and some below, indicating the importance of embedding the tubing well in the plaster. An interesting discussion session ensued and a hearty round of applause followed the speaker's talk.

Pres. J. G. Muirheid opened the meeting at the Sheraton Park Hotel. Attendance 52. Attendance ratio 0.28.

• *WEST TEXAS*: J. A. Bishop, American Blower Co., Dallas, was the guest speaker at the January meeting. Mr. Bishop discussed and described fans and his interesting talk was illustrated by slides.

The newly elected officers were then introduced as follows: *President* — L. C. McKay; *Vice President* — R. B. Carow; *Secretary* — J. C. Wharton; and *Treasurer* — J. G. Samson. Retiring Pres. R. A. Mixon presented the gavel to President McKay. Attendance 26.

• *WESTERN MICHIGAN*: Harold Holmberg introduced the speaker for the February meeting, T. A. Crawford, Timken Silent Automatic Division, Timken-Detroit Axle Co. His topic of discussion was entitled *Selling Heating and Air Conditioning*.

Pres. J. T. Anderson called the meeting to order and after the reading of the minutes he presented S. M. Paganelli, who gave a report on the Chapter's treasury.

C. H. Pesterfield expressed his appreciation to the Chapter members for their support in his election to the Council of the Society and he briefly outlined his new duties and reported on the recent meeting of the Council in Houston. Attendance 55. Attendance ratio 0.22.

• *WESTERN MICHIGAN*: The January meeting was called to order by Pres. J. T. Anderson and the minutes were read and approved by Secy. N. A. Buckley.

J. W. May, American Air Filter Co., Louisville, Ky., was the guest speaker of the evening and his talk was entitled *Selection and Application of Air Filters*. Mr. May's speech was well prepared and proved of great interest to all present. A question and answer session followed.

It was also announced that the chapter members of the Chapters Conference Committee, attending the Annual Meeting in Houston, would be Vice Pres. F. W. Brundage and the alternate would be Pres. J. T. Anderson. Attendance 42. Attendance ratio 0.25.

• *WESTERN MICHIGAN*: F. W. Brundage introduced the speaker of the evening, Lewis Smith of C. A. Dunham Co., Chicago, Ill. Mr. Smith gave a very interesting and informative talk on *Subatmospheric Steam Heating*. His talk was well received and a question and answer period followed.

The December meeting was called to order by Pres. J. T. Anderson and he then introduced S. N. Paganelli who presented a report on the Chapter's financial status. Attendance 41. Attendance ratio 0.15.

• *WESTERN NEW YORK*: The February meeting was called to order by Pres. C. W. Stone who gave a report on the Annual Meeting at Houston.

The minutes of the January meeting were read by C. W. Kaupp, secretary, and the minutes were then approved.

H. B. Carman of the Industrial Division of Combustion Engineering Inc., presented a very interesting talk on boilers. Mr. Carman illustrated his talk with a sound movie on boiler manufacturing and power plants. Attendance 45. Attendance ratio 0.28.

• *WESTERN NEW YORK*: The January meeting was called to order by C. W. Stone who read the minutes of the November and December meetings.

Alexander Kuli, American District Steam Co., Tonawanda, N. Y., was the guest speaker of the evening. Mr. Kuli showed slides of high temperature hot water installations in Europe and explained in detail how the installations were performed. A question and answer session followed this discussion and continued for a considerable time proving the interest aroused in the minds of those in attendance. Attendance 42. Attendance ratio 0.31.

• *WISCONSIN*: The January meeting was presided over by Pres. N. E. Hill at the ESM Building. Reports were given by the financial, membership, publicity, and program committees.

Gerald Mierendorf, superintendent of Power Plant at the A. O. Smith Corp. and president of the *NAPE*, was the speaker of the evening and his subject was entitled *Industrial Building Heating*. He discussed the work and history of his corporation and described in detail the different heating systems used in its buildings. Two of these systems were gas-fired space heaters and forced-air heating. Mr. Mierendorf's talk was of the utmost interest to all present and a rising vote of thanks was given to him for his excellent presentation. Attendance 55. Attendance ratio 0.21.

JOURNAL SECTION

STUDENT BRANCHES

• *PURDUE UNIVERSITY*: S. E. Fenstermaker, Jr., S. E. Fenstermaker and Co., Indianapolis, Ind., and also a member of the Indiana Chapter, was the guest speaker at the February meeting. He presented a very colorful lecture on *Baseboard Radiation* and showed slides of the installation and engineering of baseboard heating.

Chairman R. G. Supple presided over the meeting and the minutes of the previous meeting were read by R. E. Jacobs, secretary. Attendance 20. Attendance ratio 0.87.

• *UNIVERSITY OF TORONTO*: Pres. Alexander Tudor called the February meeting to order in the Mechanical Building, University of Toronto.

Prof. F. G. Ewens, an active member of the Ontario Chapter and organizer of the Toronto Student Branch, introduced the guest speaker, A. J. Strain, general manager of Ruud Mfg. Co. Mr. Strain's talk, entitled *The Effect of Alberta's Natural Gas, If and When it Reaches Toronto and Vicinity*, was centered around an economic study of piping and distribution of the gas. The possible tie-in with the natural gas gridwork from the Texas fields was also outlined. Attendance 60. Attendance ratio 1.00.

Candidates for Membership

The Society's By-Laws require that all applications for membership or advancement are to be sent to the Executive Secretary and the names of applicants and their references shall be printed in the next issue of the JOURNAL of the Society, or mailed to all members. When the replies are received from references the Candidate's application shall be submitted to and acted upon by the Admission and Advancement Committee as soon as possible.

When the Admission and Advancement Committee has acted favorably upon a Candidate's application and assigned his grade, the Council shall confirm the election of the proposed Candidate for membership. During the past month there have been 96 applications for membership, including 18 students, 5 reinstatements; in addition 11 advancements have been received. The names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Admission and Advancement Committee, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Executive Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by April 30, 1954, these candidates will be voted upon by the Council. Those elected to membership will be notified by the Executive Secretary immediately after election.

Note: †Reinstatement. *Non-member. △Advancement.

Arkansas

LEGATE, J. R., JR., Draftsman, Rawland E. Blaylock & Assoc., Little Rock. REFERENCES: R. E. Blaylock, W. A. Bullard, G. M. Cook, J. E. Thalmueller.

California

BAKER, K. M., Sales Engr., Dust Control, Inc., Hawthorne. REFERENCES: R. E. Arneson, S. F. Duncan, R. S. Farr, D. M. Sackett.

BELL, J. H., Sales Engr., Hayes Furnace Manufacturing & Supply Co., Los Angeles. REFERENCES: L. B. Davenport, J. R. Hall, A. J. Hess, J. F. Park.

BISSELL, H. R., JR., Engr., Fraser & Johnston Co., San Francisco. REFERENCES: G. H. Cardiff*, W. W. Hicks*, W. H. Johnston*, R. R. Taylor.

FLEWELLING, H. J., Chief, Engrg. Div., Veterans Administration Hospital, Fresno. REFERENCES: Clyde Bradley*, G. T. Donceel, Patrick O'Hara, Charles Parsons*.

HENRY, W. J., Sales Engr., Ventilating Equipment Co., Los Angeles. REFERENCES: J. S. Earhart, C. E. Parks, K. D. Simon, Lee Updegraff.

NIETO, P. G., Mgr., Construction Dept., Plant Asbestos Co., Emeryville. REFERENCES: G. N. Aranovsky, L. A. Meade, Robert Meyer*, Willard Smith.

WHITE, J. A., Sales Engr., E. C. Cooley Co., Sacramento. REFERENCES: Joe Clancy*, S. W. Doolittle, E. B. Green, L. A. O'Meara.

Connecticut

BARNUM, STARR, JR., Secy., The Bigelow Co., New Haven. REFERENCES: G. N. Eaton*, C. L. L'Hommedieu, Carl Wahnquist, Jr., Gustave Welter.

†KURTH, F. B., Asst. to Plant Mgr., Anemostat Corp. of America, Hartford. REFERENCES: J. B. Hewett, Fritz Honerkamp, F. J. Kurth, G. R. Wallen.

△WAHNQUIST, C. J., JR., Sales Engr., New York Plumbing Supply Co., New Haven. REFERENCES: E. J. Hoagland, D. M. Hummel, G. F. Nieske, J. D. Pierce.

District of Columbia

GAWNE, R. B., Engrg. Draftsman, Leon Chatelain, Jr., Architect, Washington. REFERENCES: H. H. Hill, L. G. Humphrey, Jr., W. C. Jones, J. J. Nolan, Jr.

Georgia

CAUGHMAN, R. B., Sales Engr., John A. Dodd Co., Atlanta. REFERENCES: J. A. Dodd, H. K. McCain, J. C. Quinn*, R. H. Yancey III.

JOHNSTON, R. M., Engr.-Mgr., Htg. and Air Cond. Dept., Dalton Public Service Co., Dalton. REFERENCES: J. E. Atchison*, R. L. Beals, Percy Shepherd*, Peter Van Dae, Jr.

TIDWELL, H. A., Pres., Mechanical Contractors & Engineers, Inc., Atlanta. REFERENCES: F. E. Baird, J. W. Borum, J. M. Lazenby, D. F. Lindstrom.

†WAGES, R. W., Engr., Georgia Power Co., Atlanta. REFERENCES: B. R. Askew*, H. S. Colbath*, W. F. Harden*, A. W. McKay.

Indiana

MONTGOMERY, S. R., Graduate Teaching Asst., Purdue University, Dept. of Mech. Engrg., Lafayette. REFERENCES: A. Baker*, D. A. Melford*, W. T. Miller, H. L. Solberg*.

Kansas

MEYER, M. E., Sales Engr., General Electric Co., Wichita. REFERENCES: B. C. Brown, J. W. Kice, A. B. Newton, Charles Yoe.

Watkins, N. B., Design Engr., The Coleman Co. Inc., Wichita. References: Earl Baker*, J. W. Kice, A. B. Newton, O. B. Strahm.

Louisiana

Gagliano, N. J., Engr. & Estimator, Cabirac Mechanical Contractors, New Orleans. References: R. K. Goode, W. B. Martin, A. R. Salzer, Jr., T. A. Stokes.

Maryland

Flashman, R. N., Project Engr., Lloyd E. Mitchell, Inc., Baltimore. References: W. P. Flanigan, W. W. Hill, B. R. Kane, R. G. Wilhelm.

Kelley, H. M., Sales Engr., Minneapolis-Honeywell Regulator Co., Baltimore. References: M. V. Eusey, Jr., G. V. K. Greene, W. J. Law, J. K. Wolford.

Prey, C. W., Sr. Sales Engr., Minneapolis-Honeywell Regulator Co., Baltimore. References: M. V. Eusey, Jr., W. P. Flanigan, R. R. Poole, E. H. Taze.

Vaeth, F. J., Jr., Project Engr., Lloyd E. Mitchell, Inc., Baltimore. References: W. P. Flanigan, A. M. K. Kroft, E. J. Morris, E. H. Taze.

Massachusetts

Cantlin, J. H., Asst. General Mgr., Fenwal Inc., Ashland. References: W. G. Andrew*, D. T. King*, R. H. Matthews*, J. N. Wood*.

Dower, G. I., Sales Engr., The John Bonner Co., Inc., Cambridge. References: John Bonner, C. T. Flint, J. N. Gates, A. L. Hare.

Michigan

Mayer, V. W., Appl. Engr., Hydraline Products, Borg-Warner Corp., Detroit. References: J. A. Guy, W. A. Schoonover, W. P. Steffens, R. A. Wilson.

Pon, D. F., Mech. Engr., Victor Gruen & Assocs., Detroit. References: L. A. Burch, G. A. Fleisher, J. B. Olivieri, Albert Petronis.

Stanesa, Eli, Engr., B. & S. Fabricators, Roseville. References: N. B. Elliot, L. G. Miller, C. H. Pesterfield, K. E. Robinson.

△Vandervort, R. B., Asst. Mgr., Hager-Fox Heating & Refrigeration Co., Lansing. References: E. C. Fox, L. G. Miller, C. H. Pesterfield, R. J. Waalkes.

Minnesota

Bruch, W. C., Mech. Engr., Magney, Tusler & Setter, Minneapolis. References: J. A. Craig, L. D. Freeland, L. C. Gross, H. G. Sierk.

†Huckins, E. R., Asst. General Mgr., The Waterbury Co., Minneapolis. References: F. W. Legler, W. F. Legler, B. F. McLouth, C. A. Schad.

Van Drasek, J. R., Sr., Warm Air Heating Inspector, Minneapolis Building Dept., Minneapolis. References: M. L. Allendorf, H. M. Betts*, A. F. Hovda, D. L. Oslund.

Mississippi

Booth, G. T., Jr., Partner, George T. Booth & Sons, Vicksburg. References: J. T. Canizaro*, J. W. Doggett, Jr., T. E. Stepan, J. W. Taylor.

Luke, T. D., Jr., Partner, Hamilton-Schultz-Luke, Cons. Engrs., Jackson. References: J. G. Coleman, Jack Davis*, W. M. Hamilton, I. E. Rowe.

Missouri

McCallister, O. L., Jr., Appl. Engr., Minneapolis-Honeywell Regulator Co., St. Louis. References: E. T. Clucas, N. R. Maloney, H. C. Sharp, B. C. Simons.

New Jersey

Bell, M. H., Chief Mech. Engr., Erwin Gerber, Architect, Newark. References: M. C. Christesen, Donald Hamilton, A. I. McFarlan, Kenneth Miller.

Rogers, J. C., Sales Engr., Bell & Gossett Co., Morris Plains. References: J. M. Chipman, Frank Gall, E. W. Koenig, R. A. Patterson.

Sage, Alexander, Chief Engr., Charles Simkin & Sons, Inc., Hopelawn. References: Kenneth Miller, G. C. Norman, Milton Simkin, P. H. Werner.

Thayer, A. L., Staff Engr., Johns-Manville Corp., Manville. References: J. L. Frank, J. T. Melichar*, J. F. Munder, George Norman.

New York

Contardi, A. C., Sales Engr., Carrier Corp., New York. References: O. W. Armspach, Albert Gianinni, R. H. Leveridge, L. J. Wachs.

△Gilman, S. F., Research Section Head, Carrier Corp., Syracuse. References: J. W. James, S. Konzo, R. J. Martin*, E. P. Palmatier.

Hall, L. A., Research Engr., Carrier Corp., Syracuse. References: C. M. Ashley, S. F. Gilman, W. A. Grant, E. P. Palmatier.

Ohio

Blackburn, P. M., Jr., Sales Engr., Minneapolis-Honeywell Regulator Co., Columbus. References: J. W. Ford, J. A. Guy, W. R. Kinney, C. O. Walcutt.

Blonchek, W. F., Sales Engr., Cleveland Air Conditioning Corp., Cleveland. References: L. F. Auerbach, H. R. Canoyer, E. C. Skerkoski, R. D. Wilson.

Breyer, W. C., Works Engr., National Carbon Co., Cleveland. References: L. A. Fisher*, G. D. Hudelson, E. F. Morse, M. L. Smith*.

Davis, L. J. F., Plant Engr., Bendix-Westinghouse Automotive Air Brake Co., Elyria. References: L. S. Ries, E. J. Sable, N. H. Von Kamp, R. D. Wilson.

Duston, D. W., Sales Repr., The Trane Co., Toledo. References: G. W. Bleckner*, F. A. Edgington, T. F. Geikie, F. C. Richardson, Jr.

Fogarty, W. H., Prod. Appl. Engr., American Air Filter Co., Dayton. References: R. C. Allen, F. H. Doench, Jr., G. R. Helmig, J. M. Schweiger.

Hamilton, J. W., Jr., Contract Engr., Carrier Corp., Cleveland. References: L. A. Burch, R. H. Oberschulte, J. B. Olivieri, Albert Petronis.

Heiser, G. L., Mech. Engr., Amstan Supply Div., American Radiator & Standard Sanitary Corp., Toledo. References: F. A. Edgington, F. C. Richardson, Jr., W. F. Simon*, J. W. Woodson.

Kahl, W. H., Mgr., Engrg. Sales Div., The Shaw Kendall Engineering Co., Toledo. References: J. R. Gass*, Oscar Hartman*, H. A. Knowlson*, R. J. Mugfor*.

Lewis, H. R., Sales Engr., Thermal Products Co., Cleveland. References: J. L. Frisse, E. F. Morse, W. F. D. Neiheiser, W. M. Rogers.

Lunt, R. F., Sales Engr., Iron Fireman Mfg. Co., Cleveland. References: J. W. James, W. C. Kelly, E. C. Webb, R. C. Wright.

△Rishel, J. B., Partner, James B. Rishel Co., Dayton. References: R. W. Kimmel, J. M. Schweiger, D. E. Tullis, C. D. Weaver.

Rubin, R. M., Engr., Feldman Brothers Co., Cleveland. References: L. C. Burkes, J. L. Frisse, W. F. D. Neiheiser, H. R. Weiner.

Swab, R. K., Associate Engr., Barber-Evans & Assocs., Toledo. References: C. L. Barber, F. A. Edgington, J. F. Guest, C. F. Hoffman.

Tracey, D. B., Mgr., Columbus Automatic Sprayer Co., Columbus. References: H. A. Crawford, F. W. Gurley, N. T. Hess, R. A. Wilson.

Wright, R. J., Resident Engr., W. W. Sly Mfg. Co., Cleveland. References: J. L. Gibson*, E. F. Morse, L. M. Sell*, William Taylor.*

Oregon

Longstaff, J. B., Design Engr., W. Bruce Morrison, Cons. Engr., Portland. References: Richard Blankenship, A. P. Crombie, Tai Funatake, W. B. Morrison.

Pennsylvania

Gatewood, L. C., Jr., Vice Pres. and General Mgr., Air-A-Therm Corp., Philadelphia. References: M. E. Barnard, L. M. Church, E. H. Dafter, R. V. Smith.

Green, R. C., Jr., Vice Pres., Raymond C. Green & Co., Jenkintown. References: R. L. Bitzer, V. R. Bitzer, C. J. Forve, G. F. Smith.

Hall, J. H., Repr., Bell & Gossett Co., Bridgeville. References: G. M. Comstock, P. A. Edwards, H. B. Grabman, E. S. Tower.

Henry, C. R., Air Conditioning Engr., Manufacturers Light & Heat Co., Pittsburgh. References: J. A. Peck, H. A. Pietsch, L. C. Smith, M. L. Tepper*.

Metzger, H. G., Jr., Mech. Engr., Bristol Engineering Corp., Bristol. References: H. S. Berg*, A. C. Caldwell, C. T. Dingleman*, R. R. Wiese.

Rhode Island

△Tesar, R. J., Sales Repr., Taco Heaters Inc., Providence. References: John Bonner, E. T. Houlihan, T. F. Houlihan, J. R. Murphy.

South Carolina

△Donovan, R. F., Associate, E. W. Klein & Co., Columbia. References: M. R. Durlach, Jr., H. W. Hood, W. E. Kerr, E. W. Klein, Jr.

Sanders, H. L., Gas Sales Mgr., South Carolina Electric & Gas Co., Columbia. References: A. L. Blackstone, Jr., J. W. Clark, Jr., F. B. Herty, H. L. McDowell.

Tennessee

△Breman, P. J., Engr., Carbide & Carbon Chemical Co., Oak Ridge. References: W. E. Dunlap*, J. C. Little*, H. L. Martin*, Edward VanWagenen.

Texas

Fox, D. C., Engr., Farwell Co., Inc., Dallas. References: T. H. Anspacher, W. E. Frost, F. L. Gray, Jr., R. C. Wallis, Jr.

△Gray, F. L., Jr., Sales Engr., Ray Engineering Co., Dallas. References: W. E. Frost, J. P. Licandro, G. H. Meffert, S. I. Sirmen.

Hampton, L. A., Mech. Draftsman, Brown & Root, Inc., Houston. References: O. H. Atkins, K. C. Fink, A. A. Rassmussen, D. S. Smith.

Huddleston, A. J., Designer, Brown & Root, Inc., Houston. References: W. J. Aubertin*, J. F. Eberhart*, K. C. Fink, D. S. Smith.

Lucente, F. J., Estimator, Johns-Manville Sales Corp., Houston. References: E. G. Floeter, Jr., J. A. Poole, R. J. Speichs, Norman Way.

McMillin, R. V., Partner, General Heating and Air Conditioning Co., Dallas. References: R. M. Burgess, H. W. Gillis, Jr., W. R. Hopkins, D. L. Moody.

†Muller, H. J., Asst. Mgr., Bldg. Service Div., Prudential Insurance Co., Houston. References: Merwin Belcher*, D. S. Cooper, J. B. Kuttler, Edward Schaefer*.

Perkins, T. C., Design Engr., Dow Chemical Co., Freeport. References: P. J. Gurklis*, E. R. Ketchum, A. J. Natkin, M. B. Peiser.

Smith, A. H., Mech. Designer, Blum & Guerrero Engrs., Dallas. References: J. N. Irby, W. S. Keeney, R. L. Patton, J. A. Ray.

△Young, F. R., Pres., F. R. Young Co., Houston. References: D. S. Cooper, R. J. Salinger, R. F. Taylor, Norman Way.

Virginia

Hudson, R. C., Project Engr., Hayes, Seay, Mattern & Mattern, Norfolk. References: T. B. Carpenter, C. G. Conaway, Jr., E. D. Duval, Laurence Trant.

Ruschell, R. J., Asst. District Mgr., The Ric-wiL Co., Alexandria. References: R. R. Cover, A. M. K. Kroft, G. R. Walz, C. W. Wheeler.

Wood, W. F., District Mgr., The Ric-wiL Co., Alexandria. References: R. R. Cover, A. M. K. Kroft, G. R. Walz, C. W. Wheeler.

Washington

Morris, J. R., Associate, Kendall M. Wood, Cons. Engr., Spokane. References: H. A. Bickel, J. A. Doyle, F. W. Jenkinson, K. M. Wood.

Wisconsin

Bittner, F. J., Engr., Heating Div., The Heil Co., Milwaukee, Wis. References: H. M. Black*, R. L. King, T. H. Smoot, H. W. Snyder.

Alaska

†Alvey, R. J., Mech. Engr., U.S. Dept. Interior, Bureau of Indian Affairs, Bethel. References: William Featherstone*, William Kann*, James Oberlin, R. W. Peterson.

Canada

Austin, J. B., Sales Repr., Howard Air Conditioning & Heating Co., Toronto, Ont. References: T. J. Abbot, Leslie Campbell, G. R. Hughes*, L. K. Hughes.

Benjamin, Abraham, Cons. Engr., Westmount, Que. References: S. S. Colle, Leo Garneau, F. A. Hamlet, F. A. Sheppard.

△North, Rowland, Sales & Engineering Mgr., Crowley Plumbing & Heating Industries Ltd., Dundas, Ont. References: D. A. Price, D. O. Price, Louis Sentesy, G. E. Smith.

Veilleux, Jean, Cons. Engr., J. L. Beaudet Inc., Quebec, Que. References: Oscar Dorval, G. N. Martin, S. A. Sullivan, Y. R. Tasse.

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- **NEBRASKA:** 1940. Hdqrs., Omaha, Neb. Meets, Second Tuesday. PRESIDENT, O. J. Smith, 233 Grain Exchange Bldg., (2). SECRETARY, S. W. Black, 18th & Harney Sts.
- **NEW YORK:** 1911. Hdqrs., New York, N. Y. Meets, Third Monday. PRESIDENT, J. E. Schechter, 32-08 38th Ave., Long Island City (1). SECRETARY, Carl H. Flink, 62 Worth St. (13).
- **NORTH JERSEY:** 1952. Hdqrs., Newark, N. J. Meets, Second Tuesday. PRESIDENT, F. H. Faust, 5 Lawrence St., Bloomfield. SECRETARY, C. H. Smith, 2490 Vreeland Mills Rd., Linden.
- **NORTH TEXAS:** 1938. Hdqrs., Dallas, Tex. Meets, Third Monday. PRESIDENT, M. W. Brown, 1213 Texas Bank Bldg. SECRETARY, H. G. Gregerson, 2921 Fairmount.
- **NORTHEASTERN OKLAHOMA:** 1948. Hdqrs., Tulsa, Okla. Meets, Second Tuesday. PRESIDENT, R. W. Winget, 2428 E. 11th St., Box 100. SECRETARY, J. T. McKinney, 1341 So. Boston.
- **NORTHERN OHIO:** 1916. Hdqrs. Cleveland, Ohio. Meets, Second Monday. PRESIDENT, J. M. Black, 1296 Gordon Rd., Lyndhurst. SECRETARY, Sherwood Nassau, 6014 Euclid Ave.
- **NORTHERN PIEDMONT:** 1952. Hdqrs., Greensboro, N.C. Meets, Second or Third Friday. PRESIDENT, R. B. Crosland, Jr., 1001 S. Marshall St., Winston-Salem. SECRETARY, W. H. Cooper, 1001 S. Marshall St., Winston-Salem.
- **OKLAHOMA:** 1935. Hdqrs., Oklahoma City, Okla. Meets, Second Monday. PRESIDENT, F. X. Loeffler, Jr., Box 529. SECRETARY, G. E. Ervin, 2800 N. Oklahoma St. (5).
- **ONTARIO:** 1922. Hdqrs., Toronto, Ont., Canada. Meets, First Monday. PRESIDENT, N. W. Kingsland, 31 Willcocks St. SECRETARY, H. R. Roth, 57 Bloor St., W.
- **OREGON:** 1939. Hdqrs., Portland, Ore. Meets, Thursday after First Tuesday. PRESIDENT, A. N. Hoss, 621 S.W. Alder (5). SECRETARY, J. E. Finkbeiner, 10260 S.W. Daphne Pl. (1).
- **OTTAWA VALLEY:** 1952. Hdqrs., Ottawa, Ont., Canada. Meets, Third Tuesday. PRESIDENT, G. L. Ostiguy, 282 Westhill Ave. (3). SECRETARY, N. J. Howes, Box 264, R. R. 1.
- **PACIFIC NORTHWEST:** 1928. Hdqrs., Seattle, Wash. Meets, Second Tuesday. PRESIDENT, H. T. Orebaugh, 1330 Dearborn. SECRETARY, L. F. Christofferson, 7358-58th Ave. N.E., (5).
- **PHILADELPHIA:** 1916. Hdqrs., Philadelphia, Pa. Meets, Second Thursday. PRESIDENT, C. F. Dietz, 3449 W. Indiana Ave. (32). SECRETARY, P. H. Yeomans, Architects Building (3).
- **PITTSBURGH:** 1919. Hdqrs., Pittsburgh, Pa. Meets, Third Monday. PRESIDENT, C. H. Schneider, 310 Washington Rd. SECRETARY, E. H. Riesmeyer, Jr., 231-33 Water St. (22).
- **ROCKY MOUNTAIN:** 1944. Hdqrs., Denver, Colo. Meets, First Wednesday. PRESIDENT, H. L. Wray, 1101 Geneva St., Aurora. SECRETARY, J. F. Cipra, Jr., 2676 S. Madison St.
- **SACRAMENTO VALLEY:** 1952. Hdqrs., Sacramento, Calif. Meets, First Wednesday. PRESIDENT, E. C. McKinsey, 4220 Annette (21). SECRETARY, R. A. Sarro, 5412 Argo Way.
- **ST. LOUIS:** 1918. Hdqrs., St. Louis, Mo. Meets, Second Tuesday. PRESIDENT, H. C. Sharp, 4060 W. Pine Blvd. (8). SECRETARY, W. P. Norris, 1118 Fullerton Bldg.
- **SHREVEPORT:** 1948. Hdqrs., Shreveport, La. Meets, Third Thursday. PRESIDENT, M. A. Hudson, 753 Gladstone Blvd. SECRETARY, R. S. Segall, 603 Cotton St.
- **SOUTH TEXAS:** 1938. Hdqrs., Houston, Tex. Meets, Third Friday. PRESIDENT, E. G. Floeter, Jr., P.O. Box 1657 (1). SECRETARY, F. M. Neil, 3513 W. Dallas Ave. (19).
- **SOUTHERN CALIFORNIA:** 1930. Hdqrs., Los Angeles, Calif. Meets, First Tuesday. PRESIDENT, L. B. Davenport, 137 S. Anderson St. (33). SECRETARY, J. L. McCullough, 1978 S. Los Angeles St. (11).
- **SOUTHERN PIEDMONT:** 1952. Hdqrs., Charlotte, N.C. PRESIDENT, R. S. Fullerton, P.O. Box 3697. SECRETARY, J. R. Clark, P.O. Box 1755.
- **SOUTHWEST TEXAS:** 1946. Hdqrs., San Antonio, Tex. Meets, Third Tuesday. PRESIDENT, L. H. Hornor, Jr., 816 Insurance Bldg. SECRETARY, Boone Crisp, P.O. Box 9065, (4).
- **UTAH:** 1944. Hdqrs., Salt Lake City, Utah. Meets, Third Thursday. PRESIDENT, M. L. Gollaher, 1163 Roosevelt Ave. (5). SECRETARY, G. L. Soderborg, Sr., 42 E. 8th St. S.
- **VIRGINIA:** 1946. Hdqrs., Norfolk, Va. Meets, Third Wednesday. PRESIDENT, H. E. Marquart, 111 W. Main St. SECRETARY, R. L. Burton, Jr., 1913 Lafayette Blvd.
- **WASHINGTON, D. C.:** 1935. Hdqrs., Washington, D. C. Meets, Second Wednesday. PRESIDENT, J. G. Muirheid, Bureau of Ships, Navy Dept. (25). SECRETARY, W. C. Reamy, Jr., 720 Mills Bldg. (6).
- **WEST TEXAS:** 1953. Hdqrs., Lubbock, Tex. PRESIDENT, L. C. McKay, 210 Sanford Bldg. SECRETARY, J. C. Wharton, Box 1240.
- **WESTERN MICHIGAN:** 1931. Hdqrs., Grand Rapids, Mich. Meets. Second Monday. PRESIDENT, J. T. Anderson Michigan State College, East Lansing. SECRETARY, N. A. Buckley, 514 Park Rd., Jackson.
- **WESTERN NEW YORK:** 1919. Hdqrs., Buffalo, N. Y. Meets, Second Monday. PRESIDENT, C. W. Stone, 1219 Main St. (9). SECRETARY, C. W. Kaupp, 271 Delaware Ave.
- **WISCONSIN:** 1922. Hdqrs., Milwaukee, Wis. Meets, Third Monday. PRESIDENT, N. E. Hill, 122 N. Hartwell Ave., Waukesha. SECRETARY, K. H. Forfar, 2711 N. 27th St. (10).

SPECIAL BRANCH

- **SWISS:** 1952. Hdqrs., Zurich, Switzerland. PRESIDENT: Walter Sennhauser, Sulzer Bros., Ltd., Winterthur. SECRETARY, Walter Hausler, Erbstrasse 2, Kusnacht, Zurich.

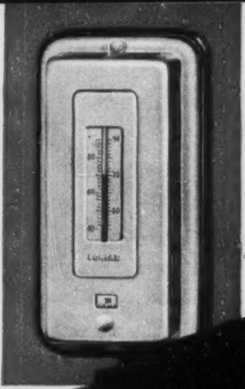
STUDENT BRANCHES

- **NORTH CAROLINA STATE COLLEGE:** 1948. Hdqrs., Raleigh, N. C. PRESIDENT, Norman Falbaum, Box 4668, State College Station. SECRETARY, J. L. Flowers, Apt. 33-E, Vetville.
- **OKLAHOMA A. & M. COLLEGE:** 1950. Hdqrs., Stillwater, Okla. PRESIDENT, C. E. Durrett, 1215 College. SECRETARY, R. M. Jauch, 308½ W. Maple.
- **OREGON STATE COLLEGE:** 1949. Hdqrs., Corvallis, Ore. Meets, First Wednesday after First Tuesday. PRESIDENT R E. Bulletset, 252 Kings Rd. SECRETARY, I. P. Parkhurst, 1354 Harrison.
- **PURDUE UNIVERSITY:** 1948. Hdqrs., W. Lafayette, Ind. CHAIRMAN, R. G. Supple, 640 Russell St. SECRETARY, R. E. Jacobs, 1534 Colfax St., Lafayette.
- **TEXAS A. & M. COLLEGE:** 1946. Hdqrs., College Station, Tex. Meets, Second and Fourth Tuesday. PRESIDENT, D. F. Carroll, Box 6264. SECRETARY, C. W. Farrar, Jr., Rt. 1, Box 339, Bryan.
- **UNIVERSITY OF DETROIT:** 1949. Hdqrs., Detroit, Mich. Meets, First Tuesday. PRESIDENT, J. R. Cairns, 4001 Florence, (21). SECRETARY, W. E. Zimmerman, 15359 Lauder (27).
- **UNIVERSITY OF KANSAS:** 1949. Hdqrs., Lawrence, Kans. Address mail to Dr. Warren E. Snyder, chairman, Dept. of Mechanical Engineering, University of Kansas.
- **UNIVERSITY OF TEXAS:** 1949. Hdqrs., Austin, Tex. Meets, First and Third Tuesday.
- **UNIVERSITY OF TORONTO:** 1951. Hdqrs., Toronto, Ont. CHAIRMAN, Alexander Tudor, 75 South Dr. SECRETARY, T. M. Devine, More House, St. Michaels College.

Robert Shaw Dormitory

MICHIGAN STATE COLLEGE

EAST LANSING, MICHIGAN



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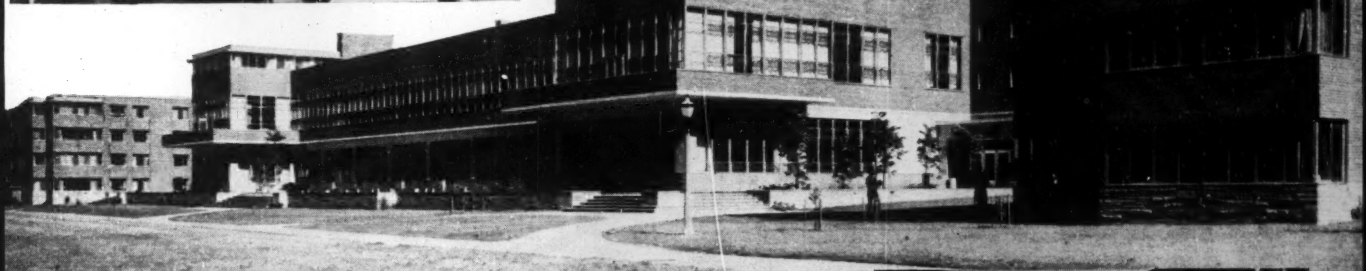

POWERS
TEMPERATURE CONTROL

Selected For The Heating And Ventilating System
And 180 Individual Shower Baths

No compromise with safety or comfort in showers here.

After thorough tests and comparison with other shower regulators, Powers thermostatic water mixers were installed in Shaw Dormitory. Here are some of the reasons why:

1. In a shower regulated by a Powers mixer – there's no danger of scalding nor slipping and falling while trying to dodge a "shot" of hot or cold water due to **pressure** or **temperature** changes in water supply lines.
2. Failure of cold water supply to a Powers mixer instantly and **completely** shuts off the shower delivery.
3. A sudden 100° F. rise in hot water supply is barely noticeable in a shower regulated by a Powers mixer. Being thermostatic it protects bathers from scalding caused by "dead ends" in hot water supply lines.
4. Temperature of shower is **thermostatically** limited to 115° F.

Why risk shower accidents, unfavorable publicity and time consuming law suits? It's more economical to install Powers thermostatic mixers . . . They cost more. Their safety features make them worth more!

Don McAuliffe, football star on Michigan State's 1952 National Collegiate Champions, enjoying one of the 180 Powers regulated showers in the Shaw Dormitory.

WARMER
POWERS

POWERS THERMOSTATIC WATER MIXER complies fully with Veterans Hospital safety requirements in Federal Specifications WW-P541a.

THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS

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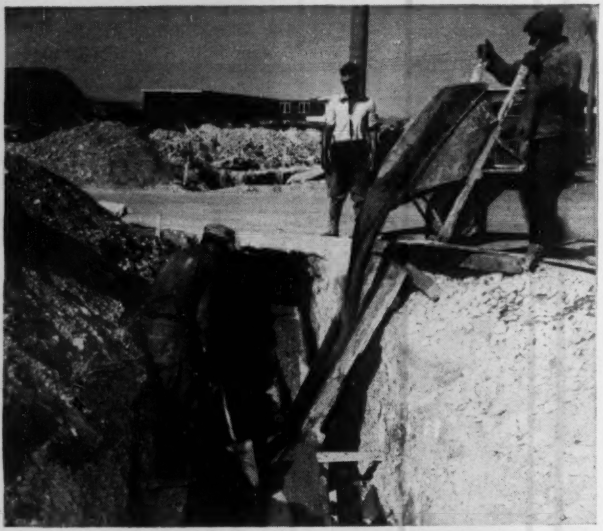


SIMPLE SYSTEM. Easy-does-it! Typical Z-crete installation on 2-pipe system. Chute carries material into the forms. Light puddling assures a complete filling of forms.

COMPLEX SYSTEM. A large steel mill makes an easy protective job of insulating 12 pipes in one conduit. Included were H.P. steam, steam traced oil lines and other utilities.

From the Simplest to the Most Complex Pipe System

"Z"crete

THE MODERN MONOLITHIC INSULATION

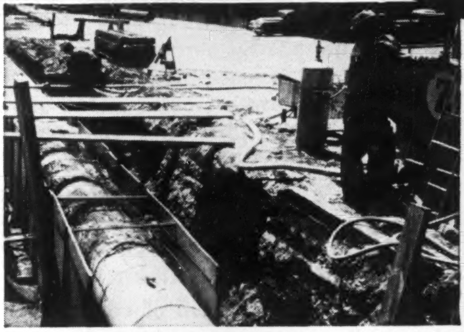
Insulates Underground Heated Piping Easier, Economically, Permanently

Z-crete handles those tough jobs with *ease.* No matter what the pipe size or arrangement, Z-crete (because it's poured) forms a permanent, monolithic protection around one pipe or a dozen... without joints or voids. Z-crete is made of inorganic, rotproof insulating concrete... poured in the field—monolithic—restricts water movement around the pipe assembly. You'll find Z-crete is usually the most economical of all systems to install... Miles upon miles of Z-crete have been *successfully* installed in *all* types of soil... even on steepest grades.

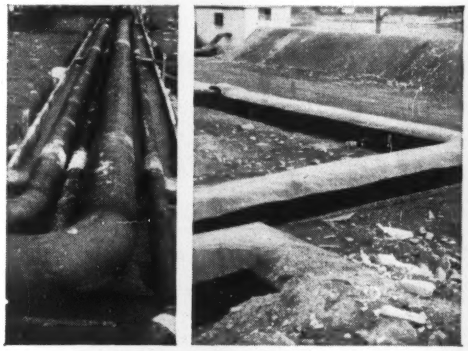
Z-CRETE *can help solve YOUR tough insulation problems, too!* *Specify* Z-CRETE

SEND FOR FREE BOOKLET

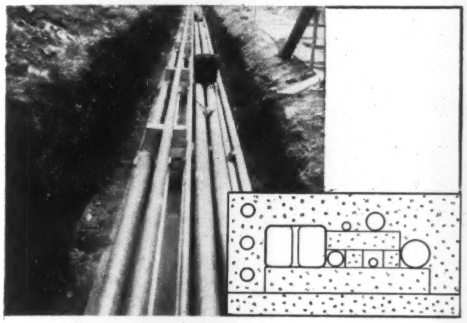
FOR "Z"crete®



No pipe too small or too large to be insulated with Z-crete. Here in city streets a large utility installs a monstrous 30″ low pressure steam supply and 10″ return pipe. Both pipes are contained in a single Z-crete conduit.



A large tank farm pipe assembly insulated with Z-crete on grade. Some of the large Z-crete conduits are used as walkways. On several occasions area has been flooded with no harmful effect on permanent, efficient Z-crete.

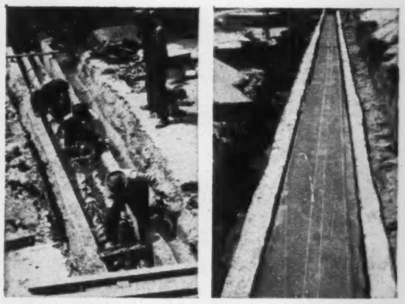


In this large hospital area Z-crete effectively insulates the complicated piping system between all buildings. Special support block shapes can be manufactured to meet special needs. Z-crete conduit is in effect a supporting pipe sleeve.

these actual photographs show how Z-crete is solving the toughest job problems

What other insulation for underground piping offers all these superior advantages

- ★ **MORE ADAPTABLE**—Z-crete is a field fabrication. Piping contractor has an easy-to-work-on concrete base pad for installing pipe. Pipes are installed—*then* insulated.
- ★ **MORE ECONOMICAL**—Low in cost, provides permanent and stable insulation. Especially economical in large-pipe or multiple-pipe installations.
- ★ **MORE EFFICIENT**—Z-crete's monolithic pour eliminates heat loss due to air movement. Six inches of insulation around pipe provides PLUS insulation value.
- ★ **PERMANENT**—Will not rot or deteriorate...water can't flow through Z-crete. Resilient, completely fire-proof.
- ★ **READILY AVAILABLE**—Z-crete materials are readily available from our many strategically located plants throughout the United States and Canada. Z-Crete is furnished and installed only by licensed applicators of Zonolite Company under U.S. Patent No. 2355966—Canadian Patent No. 439356. There is an applicator near you.



Many conduits are reinsulated with Z-crete. On this job water had ruined sectional pipe covering insulation. Pictures show before and after reinsulation. (Special pump equipment makes possible reinsulation with minimum of excavation.) It is economical to reinsulate in this manner if piping is good but insulation has deteriorated.

"Z"crete
DIVISION
Zonolite Company

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Please rush free Z-crete Booklet Z-11 with full details about this easier, better insulation of underground heated piping.

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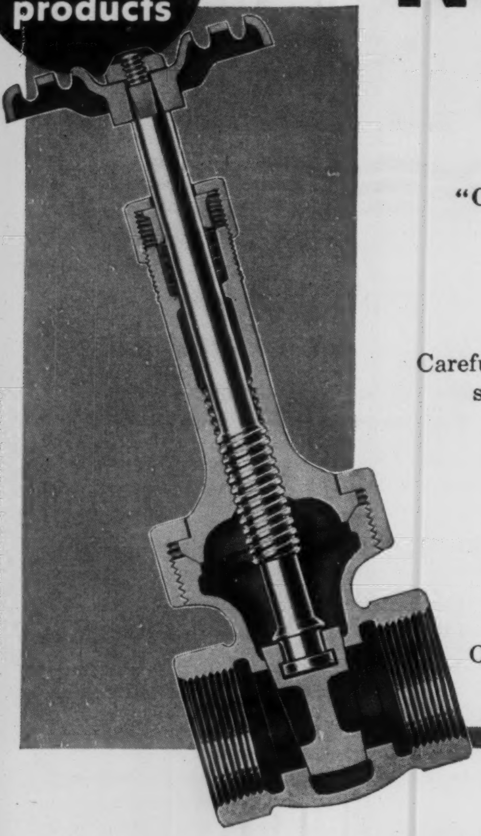


"CORADUR" is good news for valve buyers. Created specifically to provide a better material for valve stems, this important new R-P&C metallurgical development gives valve users these important advantages:

1 • DURABILITY—LONG WEAR

Careful control of metallurgical components gives physical properties, such as low coefficient of friction, which reduce wear, prolong stem life.

2 • HIGH CORROSION RESISTANCE

3 • FREEDOM FROM DEZINCIFICATION

Chemical composition protects against this form of corrosion often experienced under brackish or adverse water conditions.

4 • HIGH TENSILE STRENGTH

Over 95,000 psi—25% more than ASTM or Federal specifications.

How Quality Control Protects R-P&C's Complete Valve Line

• At R-P&C a rigorous quality control program governs every step of the manufacturing operation—insures that each R-P&C valve conforms precisely to the close tolerances established for it. Precision inspection techniques check manufacturing operations and verify material soundness to insure that the trouble-free operation and long life engineered into each R-P&C design are delivered to the valve buyer.

Modern technological developments verify exactness of manufacturing operations. All bronze, iron and steel castings for R-P&C valves are made in the R-P&C foundry under careful metallurgical controls. Radiographic techniques using radium or radioactive isotopes, verify casting soundness.

A variety of gauging methods, including some developed by R-P&C engineers, verifies dimensional accuracy of all valve parts.

Performance of each individual valve is verified by hydrostatic and other tests before it leaves the factory. These tests are normally conducted at pressures in excess of those for which the valve is rated.

ASBESTOS-PACKED COCKS, an R-P&C exclusive, are furnished in iron in sizes from ¼" to 6" with screwed or flanged ends.

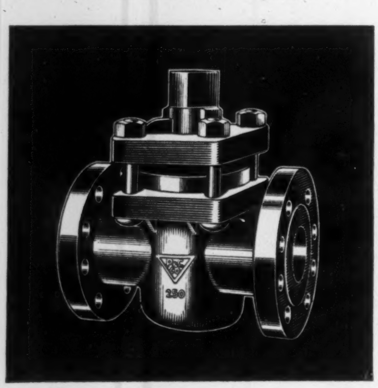
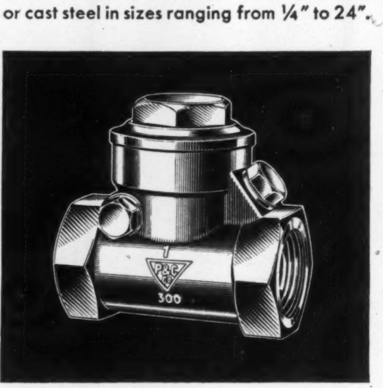


FIG. 212 SCREWED END BRONZE CHECK VALVE typifies R-P&C's complete check valve line—furnished in iron, bronze or cast steel in sizes ranging from ¼" to 24".



STEMS R-P&C BRONZE VALVES

• Stems for all R-P&C bronze globe, angle and gate valves are now machined from cold drawn, stress relieved rods of this new aluminum-silicon bronze alloy. For example, at the left is a CORADUR stem on a **Fig. 706** rising stem gate valve, which is typical of R-P&C's complete bronze valve line. Rated for 200 pounds at 500° F, this valve is provided in sizes from ¼″ to 3″. Each of these valves is hydrostatically tested at a pressure of 600 pounds before leaving the factory.

Fig. 706, like all valves in R-P&C's complete line, is packed with construction features which reduce maintenance and insure long life. For example:

Nickel Alloy Wedges

Slip-on type has perfect symmetry of faces, making wedges reversible. Milled grooves on sides engage guide ribs in body, reducing wear on seats.

Wedges are entirely removed from line of flow when valve is fully opened. This reduces vibration thus eliminating a principal cause of valve wear.

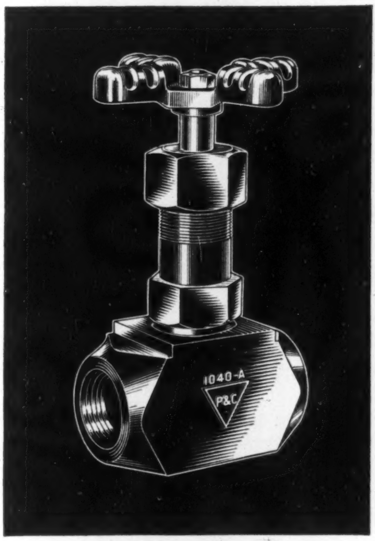
Seats, integral with body, are made of ample width, to provide high wear resistance.

Packing • Valve design removes packing from high temperature zone, prolonging life. Positive backseat permits repacking under pressure when valve is full open. Formed rings of lubricated and graphited braided asbestos facilitate repacking, prolong packing life.

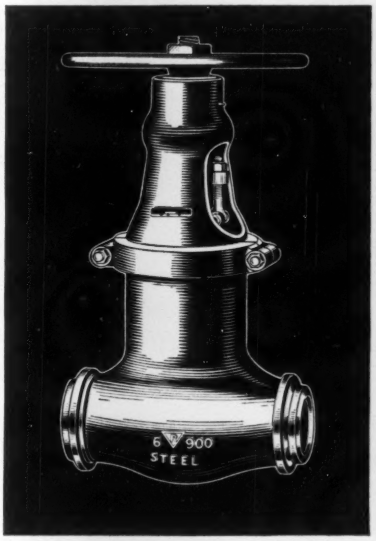
Union bonnet construction gives added strength to the valve and permits repeated removal of the bonnet without danger of distorting body or threads.

• • •

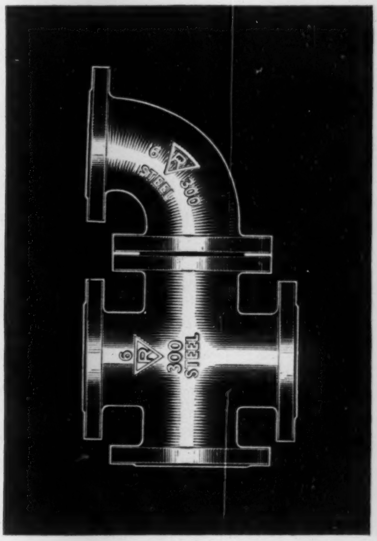
There is a valve to meet your every bronze valve requirement in R-P&C's complete line. Write today for your copy of catalog to R-P&C Valve Division, American Chain & Cable Company, Reading, Pa.



BAR STOCK VALVES are precision machined from highest quality bronze, carbon steel, or alloy steel bar stock. Working pressures range from 10,000 lbs. at 150°F to 475 lbs. at 1,000° F. Sizes from ⅛″ to 1″.



PRESSURE SEALED BONNET JOINT CAST STEEL VALVES are furnished in gate and globe valve styles in 900 lb., 1500 lb., and 2500 lb. pressure classes.



CAST STEEL FITTINGS, ells, tees, laterals, crossers, reducers—screwed or flanged ends. Furnished in sizes up to 24″, in pressure classes from 150 lbs. to 2500 lbs.

See *the complete* R-P&C *line at your distributors or write for catalog to* R-P&C *Valve Division, Reading, Pennsylvania*

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AMERICAN CHAIN & CABLE

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R-P&C valves

"What do you mean—spinning?"

"Not so fast, Joe. What's this 'spun end' business?"

"Tom, it's a natural for this job. Spinning is a development of Wolverine's—it's a simple way to form the ends of a piece of tubing exactly according to our specs."

"In other words, you can just about toss out deep drawing, stamping, or swaging as well as expensive and tricky joining operations. Wolverine takes a length of plain tube and in one simple, speedy operation completely closes the end or leaves the precise aperture you ask for! And the tube end can be necked or otherwise fabricated."

"Why that's what we're trying to do here!"

"Sure! And if you take this job to Wolverine, you'll wind up with a one-piece part. You'll cut your tool costs, speed up production, and have a negligible scrap problem."

Joe is so right: Wolverine's unique Spun End Process* cuts costs, saves time, adds to product appearance. And heating and air conditioning engineers are happy because spinning provides one-piece efficiency—no seams or joints. As a result, no leaks! And all this can be done with tubing of copper, copper-base alloys, aluminum, or electric-welded steel.

This process can help *you*! It'll pay you to contact Wolverine's Field Engineering Service for help on specific jobs. And write for a copy of Wolverine's value-packed Spun End Book. It's available—now! WOLVERINE TUBE DIVISION of Calumet & Hecla, Inc., 1461 Central Ave., Detroit 9, Mich.

Wolverine Trufin and the Wolverine Spun End Process available in Canada through the Unifin Tube Co., London, Ontario.

WOLVERINE TUBE DIVISION
OF CALUMET & HECLA, INC.

EST. 1916

Manufacturers of Quality-Controlled Tubing

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*A PATENTED PROCESS RE. 22465

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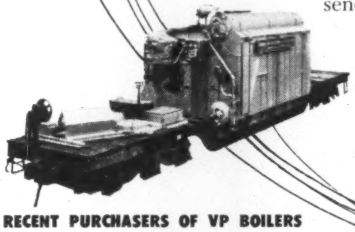
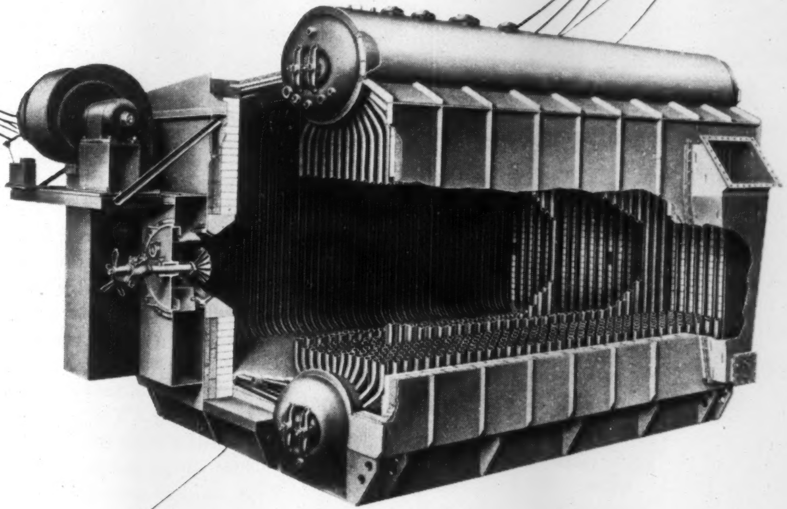
Who's buying VP boilers?

A quick perusal of the list below indicates that, varietywise, almost everyone is. Big companies and small companies representing many industries . . . chemical, paper, textile, petroleum, foods, metals, etc. – utilities, hospitals – even the Atomic Energy Commission – have purchased one or more C-E Package Boilers, Type VP.

There's significance in that fact for you. It's quite likely that all of these buyers knew that there are many "package" boilers on the market. They probably knew, too, that most of them *look* pretty much alike. But they *bought* the VP – the package boiler with *extra* features. Could be that they liked the idea, too, of buying a *small* boiler from the same company that has designed and built many of the *largest* boilers in the world.

Why not look into this VP Boiler and its *extra* features? Let us send you Catalog VP 233 which describes it in detail. B-712B





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- American Bitumuls & Asphalt Co.
- American Woolen Co.
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- Anaconda Aluminum Co.
- Ashland Oil & Refining Co., Inc., The
- Bell Telephone Laboratories, Inc.
- Cardinal Glennon Memorial Hospital
- Central of Georgia Railway Co.
- Colonial Print Works, Inc.
- Commonwealth Edison Co.
- Comp. Hulera Euzkadi, S.A.
- Container Corp. of America
- Du Pont de Nemours & Co., Inc., E. I.
- Federal Sweets & Biscuit Co., Inc.
- Ferro Stamping Machine
- Gaylord Container Corp.
- General Motors Interamerica Corp.
- Hockmeyer Brothers, Inc.
- Liquid Carbonic Corp.
- Marinette Paper Co.
- Mathieson Chemical Corp.
- Mead Corp., The
- New York Life Insurance Co.
- Omaha Public Power District
- Orangeburg Manufacturing Co.
- Pan American Refining Corp.
- Ponce Hospital Center
- Smith, Inc., J. Howard
- Southern Cotton Oil Co.
- Standard Oil Co. of British Columbia
- Sure-Seal Corp., The
- U. S. Atomic Energy Commission
- Waterfalls Tissue Corp.
- Whitaker Cable Corp.

SPECIFICATIONS — VP BOILER

Capacity	4,000 to 30,000 pounds of steam per hour
Pressures	Up to 250 pounds per square inch
Temperature	No superheat
Fuel	Oil or gas
Erection	Completely shop-assembled
Foundation	Simple concrete slab

C-E

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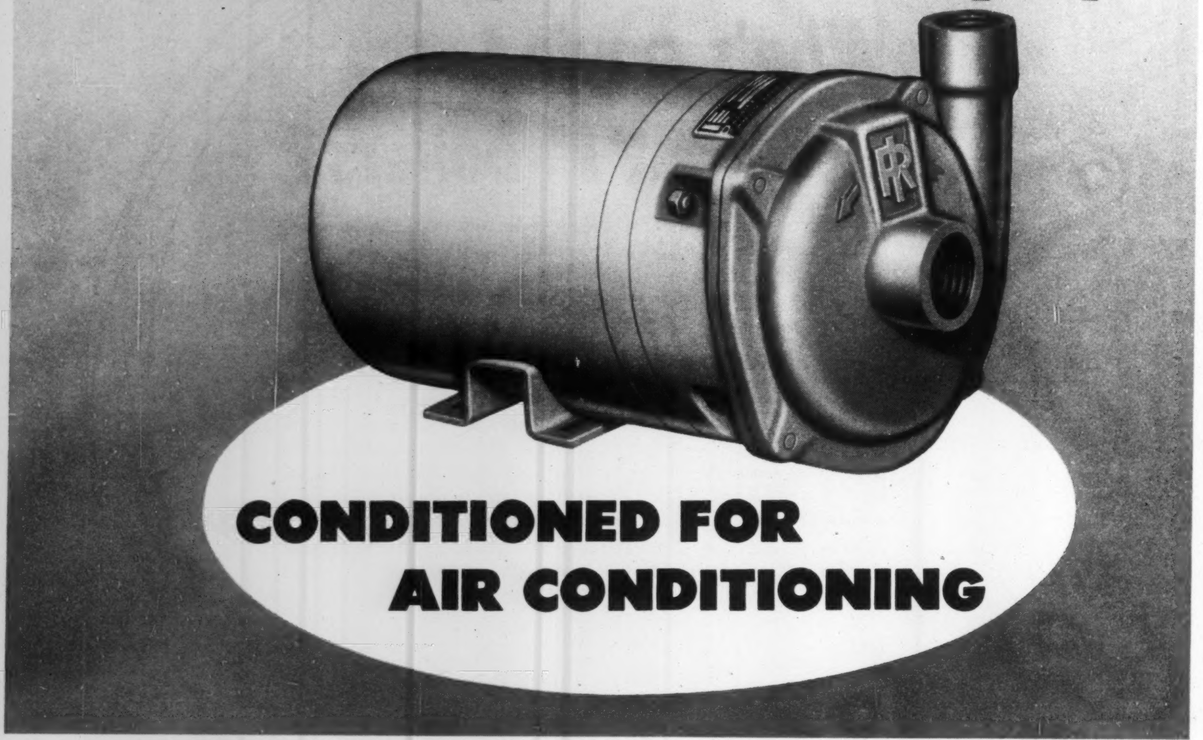
BOILERS, FUEL BURNING AND RELATED EQUIPMENT; PULVERIZERS; AIR SEPARATORS AND FLASH DRYING SYSTEMS; PRESSURE VESSELS; AUTOMATIC WATER HEATERS; SOIL PIPE

the NEW Ingersoll-Rand Motorpump



The most complete pump line for air conditioning service

The MOTORPUMP Line

⅓ to 1 hp

⅓ to 1½ hp

1 to 7½ hp

1 to 75 hp

This new Ingersoll-Rand Motorpump is truly conditioned for air conditioning work. Here is a pump with better hydraulic performance, a pump that is smaller and lighter in weight and just full of new features.

Built in ⅓, ½, ¾ and 1 horsepower sizes this new Motorpump delivers the maximum with a minimum consumption of power. If you are currently in need of an air conditioning pump that will deliver up to 48 gallons per minute and reach heads up to 100 feet, then investigate Ingersoll-Rand's new Motorpump with:

1—Mechanical seal—rotating ceramic seal face against a stationary "Teeplelite" seal face.
2—Positive impeller attachment (key and cap-screw)—not just an impeller screwed on the shaft.
3—A unique manner of rotating pump by hand to loosen seal and ring fits on spring start-up after winter shutdown.

Ingersoll-Rand now adds this unit to its famous Motorpump line that starts at ⅓ hp and goes to 75 hp. Deliveries range to 2800 gpm and heads to 650 feet.

Get in touch with your nearest I-R branch office today and build your business on satisfied customers—customers for whom you have installed an Ingersoll-Rand Motorpump.

Ingersoll-Rand
Cameron Pump Division
11 Broadway, New York 4, N. Y.

9-45

If you've got your eye on a profitable future, plan now to give positive protection to expensive piping and equipment. You'll avoid costly failure due to expansion or contraction by specifying Zallea Duo-Equalizing Expansion Joints. These joints are designed to eliminate unequal distribution of movement among the corrugations. All corrugations move simultaneously and equally during expansion or contraction of the piping—and no corrugation can be compressed or extended more than the proportional amount for which it is designed.

Zallea already has, or will make, expansion joints for every service. For information on standard types, request Bulletin 351. For consultation on special problems, ask us to have our representative call.

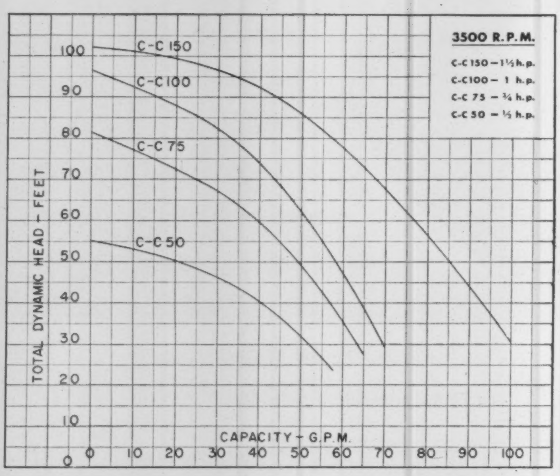
Zallea *expansion joints*

ZALLEA BROTHERS, 816 LOCUST STREET, WILMINGTON 99, DELAWARE

World's Largest Manufacturers of Expansion Joints

New CC CLOSE-COUPLED SERIES PUMPS

Set new performance standards



Each pump operates over the entire range of its curve without motor overload.

The New C-C Series pumps are more than just an improved line—they are an engineering achievement.

They definitely establish entirely new standards in close-coupled pump performance for:

Cooling Towers
Air Conditioning
Chilled Water Circulating
Hot Water Circulating
Pneumatic Water Systems
Booster Systems

The C-C Series pumps combine pump and motor in a single compact unit, eliminating coupling and alignment problems and assuring easy installation.

C-C Series pumps are equipped with a Leak-Proof "Chicago Mechanical Seal" consisting of a fixed-in-place carbon ring on a ceramic seat which is extremely hard and resistant to wear and corrosion. No maintainance or adjustment is necessary. No expensive piping is needed from drip pocket to drain. No messy floors.

See curves above for ½, ¾, 1 and 1½ H.P. models or write for Bulletin 108 F.

All models in stock for immediate shipment.

CHICAGO PUMP COMPANY

BUILDING and INDUSTRIAL DIVISION

622 DIVERSEY PARKWAY **CHICAGO 14, ILLINOIS**

Condo-Vac, Sure Return. AVC, LVC,
Fire, House & Circulating Pumps
Pneumatic & Tankless Water Systems.

Flush-Kleen Sewage Ejectors
Little Giant & Non-Clog Bilge Pumps
Pumps for every industrial use.

NOW COMPLETE PROTECTION when DRAFT FAILS

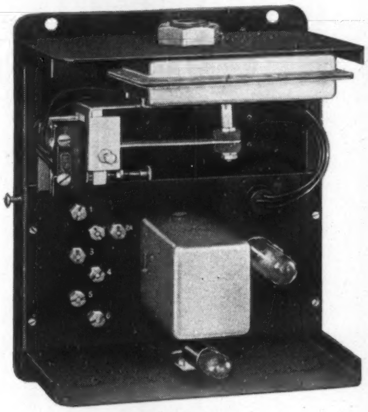
—without nuisance shut-downs from momentary puffs

CLEVELAND LO-DRAFT CUT-OFF

TRADE MARK

CLOSED VIEW

LO-DRAFT CUT-OFF



OPEN VIEW

Three models available—for 115V or 230V control circuit:

LD-A—LO-DRAFT Switch only.

LDT-A—Control with Time-delay for interrupting low-voltage burner control circuit.

LDR-A—Control with Time-delay for interrupting line voltage burner control circuit.

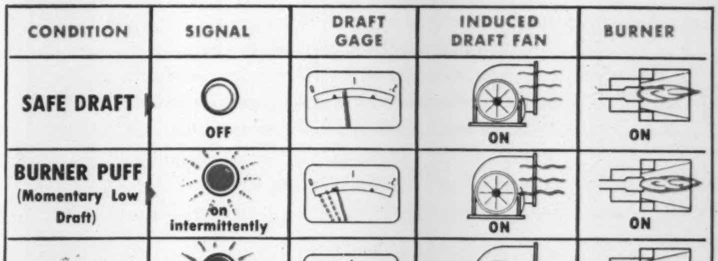
All models can be supplied to operate from wind-box pressure.

—the only "FAIL-SAFE" draft switch with TIME-DELAY FEATURE

This safety device is engineered specifically to prevent explosions or damage to boiler by automatically cutting off burner when draft fails, whether induced or natural. Only *Cleveland* LO-DRAFT CUT-OFF has all these features:

1. Sensitive enough to work from overfire draft for remote installation. Can also be installed at the breeching.
2. Cut-off point adjustable on the job—over complete range.
3. Time delay prevents momentary puffs from cutting off burner.
4. Standard unit interrupts low-voltage burner control circuit. Simple plug-in relay adapts unit for line voltage interruption.
5. Flexible diaphragm—laboratory tested to 100,000 operations without failure.
6. Signal light indicates momentary or sustained low draft.
7. Terminals provided for alarm or remote signal.
8. Hermetically sealed, plug-in time delay relay, self-compensating for ambient temperature.
9. Extra-sensitive, sealed switch with positive on-off action.
10. Absolutely *fail safe.* Failure of any component immediately cuts off burner.

LO-DRAFT CUT-OFF OPERATION



CONDITION	SIGNAL	DRAFT GAGE	INDUCED DRAFT FAN	BURNER
SAFE DRAFT	OFF		ON	ON
BURNER PUFF (Momentary Low Draft)	on intermittently		ON	ON
DRAFT FAILURE	ON		OFF	OFF

Write for complete information.

The CFE line includes damper controls, steam controls, electronic smoke detector control units, draft, air pressure and flue temperature gages.

See our Exhibit at Booth 712, Oil-Heat Show, Philadelphia, May 16—20

CLEVELAND *Fuel Equipment* **COMPANY**

1111 BROOKPARK RD., CLEVELAND 9, OHIO

Here's why more and more of America's famed buildings are installing the Yorkaire system of air conditioning

The YORKAIRE SYSTEM brings new standards of comfort to the modern miracle of air conditioning, yet see how simple it is, how easy to understand! . . .

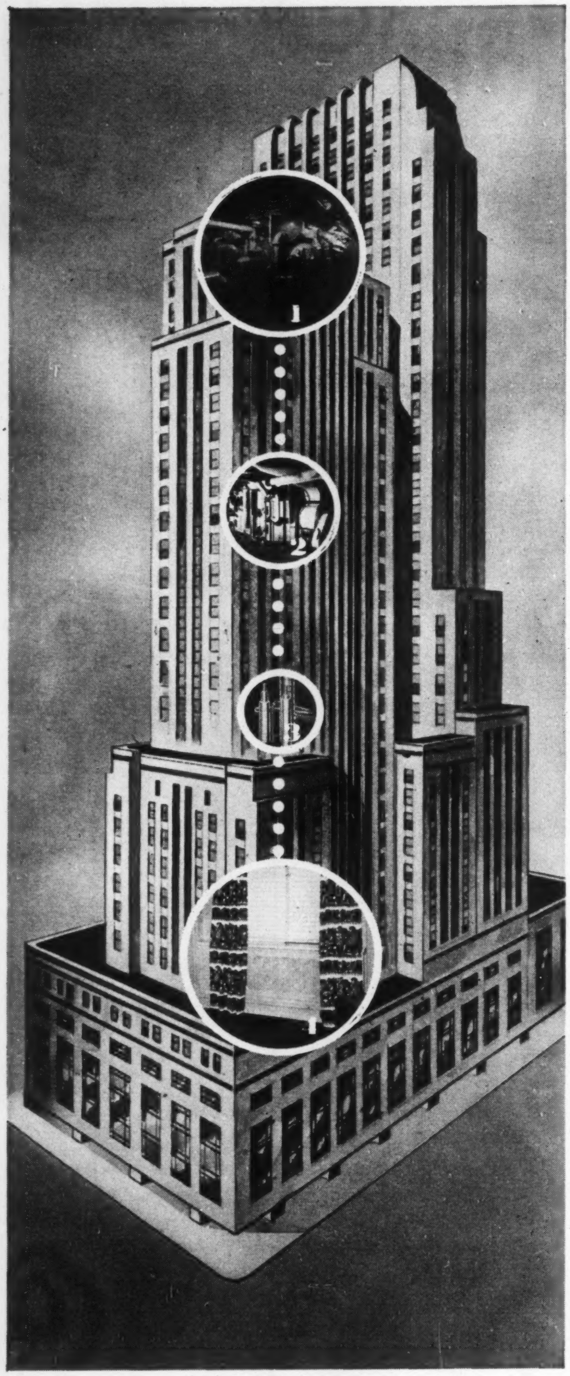
1 Source of comfort cooling is the famous and rugged York Turbo Water Cooling System which may be located on the roof of the building or in the basement.

2 Great volumes of air are brought into the building from outdoors at convenient points. This "raw" air is filtered, washed, cooled or heated, and conditioned for the right amount of moisture. When it's "just right for comfort," it begins its swift, silent journey to you.

3 Through small, space-saving, tightly sealed tubes the conditioned air is sent under mild pressure, branching out at each floor to the individual rooms. At the same time, small pipes carry hot water in winter and cold in summer to help you obtain the temperature you want.

In room units under the windows the air tube and water pipes converge. These units distribute the conditioned air in a gentle, quiet stream. A simple control allows you to refine the temperature to the conditions you desire, with no mixture of air from other rooms.

YORKAIRE SYSTEMS of Air Conditioning are being installed in building after building, old and new, across the country.



air conditioning by york

. . . Recent contracts include these famous buildings—Mile High Center, Denver; Netherland-Plaza Hotel, Cincinnati; Fulton National Bank, Atlanta; Equitable Life Assurance Society, San Francisco; Esso Standard Oil Company, Philadelphia. If you are not now enjoying this healthful comfort, perhaps you will, sooner than you think.

YORK CORPORATION York **YORK, PA.**

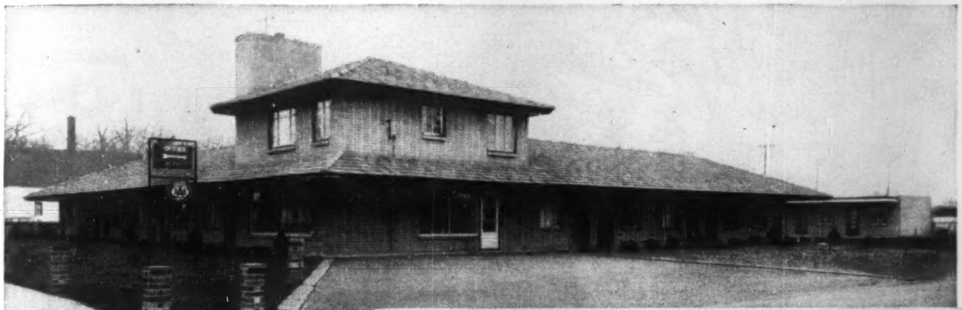
HEADQUARTERS FOR MECHANICAL COOLING SINCE 1885

BARBER COLMAN

ELECTRIC

Automatic Controls

...provide individual room temperature controls for guests at BRIKCRETE MOTEL in Grand Rapids, Michigan



Designer: (for original building) Gerald Diekema, Grand Rapids, Michigan. Architect: (for addition) Alwin S. Kolm, East Lansing, Mich. Heating Contractor: Knee Heating Co., Grand Rapids, Mich.

14-room addition to Brikcrete Motel, completed in 1953. Each room has its own Barber-Colman Thermostat, permitting each guest to adjust the temperature to his needs. ▼

▲ **Smart, modern** Brikcrete Motel in Grand Rapids attracted so much traffic a fourteen-room addition became necessary. Original building shown above houses lobby, office, and eleven guest rooms, plus manager's quarters on second floor. Zone control in this building will be changed to individual room control as used in new addition (right)

Restful main lobby of this unique motel provides guests with comfortable seating arrangements, plus television. Entire motel is constructed of Brikcrete, called "the world's most modern masonry."

Color-personalized guest rooms have attractive, modern appointments, including adjustable control of heat radiated from baseboard. Mrs. Marie Degi, manager, adjusts Barber-Colman Thermostat mounted on soundproof wall.

Simplest possible type of heating control was installed in this excellent example of present-day motel design. Individual room thermostats, motor-operated valves, and a power box are combined in an electrical system which has proved highly satisfactory. As Mrs. Degi, manager, states: "The individual control of heat in each room allows our guests to select the temperature they like best. It also allows us to turn off the heat in unused rooms during our slack season. We are impressed with the efficiency of operation and hope to install Barber-Colman units in our original building." Moreover, Mrs. Degi is considering a central time clock for reducing heat supply during sleeping hours, when many windows are open.

Flexible Barber-Colman electric controls solve a wide range of heating, cooling, and ventilating problems efficiently and economically. Phone your nearest Field Office or write for expert engineering help on *your* application.

BARBER-COLMAN COMPANY, ROCKFORD, ILL., U.S.A.

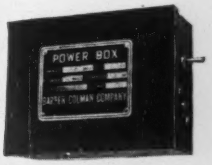
Dept. D, 1301 Rock St. • Field offices in principal cities

Automatic Controls • Air Distribution Products • Industrial Instruments • Aircraft Controls • Small Motors • Overdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

Heat-anticipating Room Thermostat

Motor-operated Valve

Power Box Cabinet



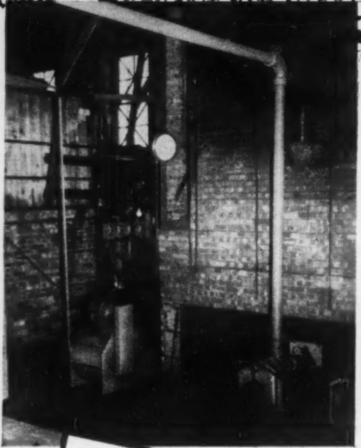
Oil-fired boiler provides hot water (two-pipe system) for heating, washing, bathing, and laundry facilities. Barber-Colman equipment illustrated provides simple, dependable, individual room comfort. Inside Power Box Cabinet are a transformer, disconnect switch, and an overload circuit breaker.

"We 'educated' our College Heating Plant...

with a modern coal installation we saved more than a third of our fuel bill,"

says Mr. James Gribben, Chief Engineer of Bethany College, Bethany, West Virginia.

"Colleges watch operating costs as closely as any business firm—and one big item for our college is the heating bill. That's exactly why Bethany went to the expense of putting in new coal heating equipment! Our old system supplied heat for sixteen buildings—to the tune of 2,600 tons of coal a year. Our new installation, with its automatic stoker, does the same job using only 1,650 tons. That's a fuel saving of 38.9%! Our eyes certainly have been opened to the efficiency and economy of *bituminous* coal—especially when it's burned with modern equipment."



Here's Bethany's new boiler room, showing the pipe of the automatic stoker. **THIS MODERN EQUIPMENT WILL PAY FOR ITSELF, THROUGH FUEL SAVINGS ALONE, IN LESS THAN TWO YEARS!**

Modern combustion installations can add anywhere from 10% to 40% to the energy obtained from the same amount of coal in years gone by. Great advances have been made in coal- and ash-handling equipment, too—cutting labor costs—making coal as clean and convenient to use as any fuel.

If you're planning to modernize your present installation—or thinking of building a new plant, call in a competent consulting engineer. He'll show you how a modern coal system designed to meet your specific needs can save you money and serve you better!

And don't forget—you'll always be able to get the coal you need. America's coal industry is the most efficient in the world. America's coal reserves are ample for centuries to come. Right now and for the future, too, coal users can be assured of a dependable fuel supply at reasonable prices.

If you're running your own steam plant—for heat or for power—you just can't afford to ignore these facts!

COAL in most places is today's most economical fuel.

COAL resources in America are adequate for all needs—for hundreds of years to come.

COAL production in the U.S.A. is highly mechanized and by far the most efficient in the world.

COAL prices will therefore remain the most stable of all fuels.

COAL is the safest fuel to store and use.

COAL is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

BITUMINOUS COAL INSTITUTE
A DEPARTMENT OF NATIONAL COAL ASSOCIATION
Washington, D. C.

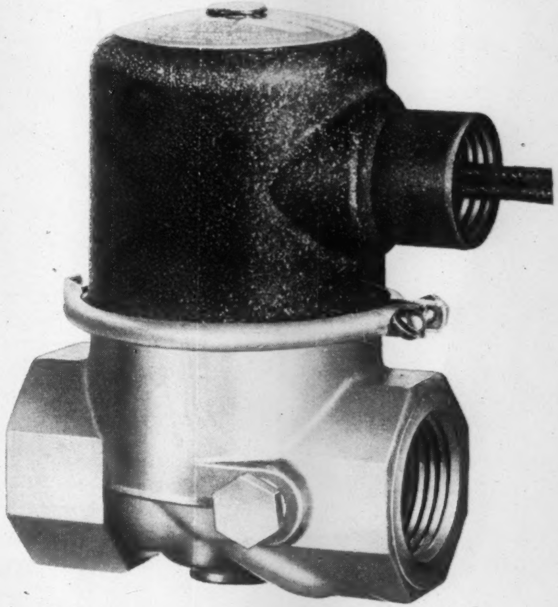
FOR HIGH EFFICIENCY FOR LOW COST

YOU CAN COUNT ON COAL!

General Controls

K-3A ...better 4 ways

Magnetic Gas Valves



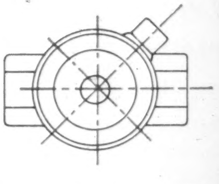
For 24 years the name "General Controls" has signified engineering ingenuity coupled with design simplicity. The K-3A Magnetic Gas Valve is an example. Designed for easy installation and maintenance, its conduit connection rotates 360 degrees and its coil is readily removable. It's tight, more positive closing is the result of a highly efficient solenoid, spring loading directly on the valve disc, and the use of gas pressure on top of the seat. Standard with synthetic valve disc that assures quiet, impact-noise-free operation. Available for any voltage or frequency and operable with any kind of commercial gas, this high capacity Magnetic Gas Valve has become the accepted standard for quiet operation of gas-fired equipment.

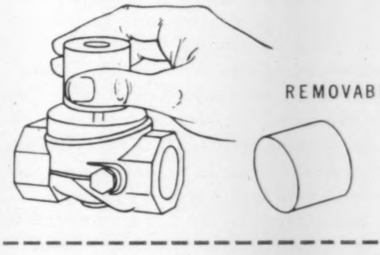
K-3A Magnetic Gas Valve for automatic control of gas fired domestic and commercial applications. All voltages . . . all gases . . . available in valve sizes from ⅜ to 1¼ inches.

GENERAL CONTROLS

Plants in: Glendale, Calif., Burbank, Calif., Skokie, Ill.
Factory Branches in 37 Principal Cities
SEE YOUR CLASSIFIED TELEPHONE DIRECTORY

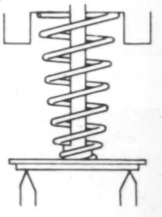
CONDUIT ENTRY ROTATES 360°



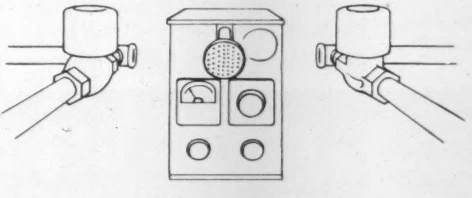


REMOVABLE COIL

SPRING LOADED TO SEAT FOR TIGHTER CLOSING



HIGH IMPACT • LOW SOUND, BY ACTUAL TEST



Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls for Heating, Home Appliances, Refrigeration, Industrial and Aircraft Applications.

is something

ALWAYS

missing?

(to cut your profit)

...then switch to the one line that meets every selling need

***EXAMPLE No. 2:** You'll agree that maintaining your profit depends largely on minimizing profit-shrinking "call backs" or better—eliminating them entirely. That's why—at Bryant—we strive *first* to give you a quality product . . . secondly for a competitive price. And that's why, as a Bryant dealer you can confidently expect this significant selling advantage. A quality product . . . priced to sell competitively . . . engineered to protect your profit . . . designed to become a permanent advertisement for your services.

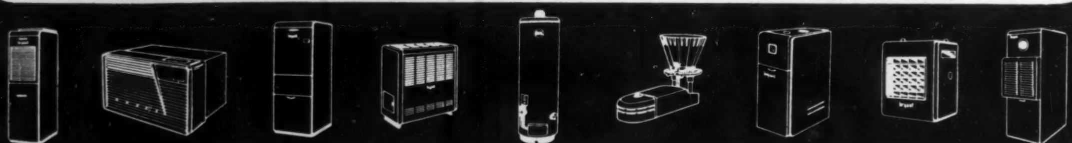
Your nearby Bryant Distributor has complete details. It will pay you to call him today.

bryant®

HEATING AIR CONDITIONING WATER HEATING

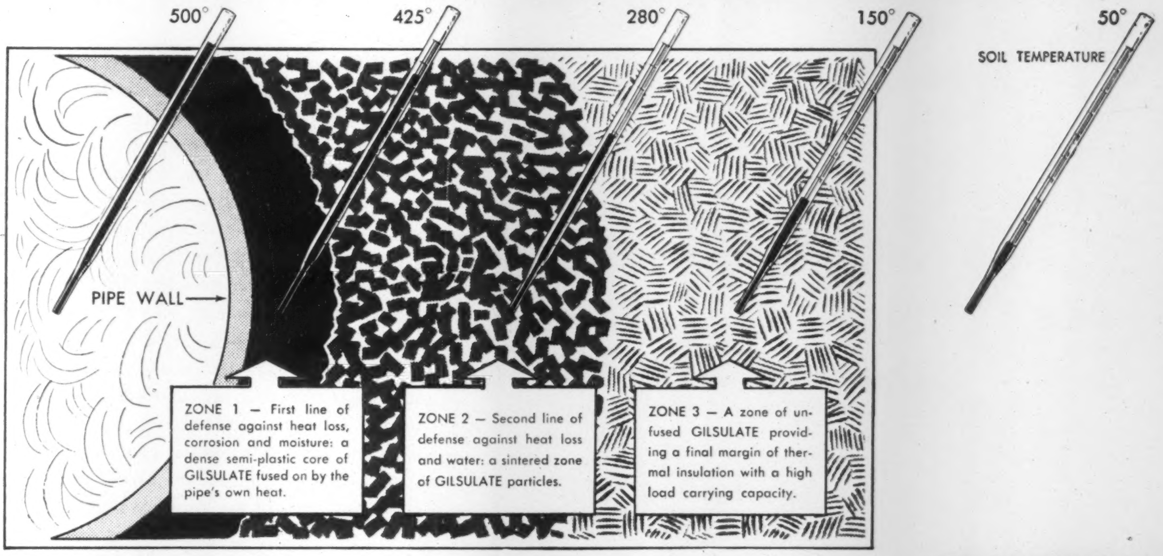
1. The most complete line in the industry
2. * Quality products—Competitively priced
3. Established name—Good customer acceptance
4. Broad, attractive profit margins
5. Local Distributor warehousing and service
6. Factory district representatives and traveling sales training and service teams

Bryant Heater Div., Affiliated Gas Equipment, Inc., 17825 St. Clair Ave., Cleveland 10, Ohio



Lowest Cost

PER INSTALLED LINEAR FOOT OF ANY HOT UNDERGROUND PIPE INSULATION



ZONE 1 — First line of defense against heat loss, corrosion and moisture: a dense semi-plastic core of GILSULATE fused on by the pipe's own heat.

ZONE 2 — Second line of defense against heat loss and water: a sintered zone of GILSULATE particles.

ZONE 3 — A zone of unfused GILSULATE providing a final margin of thermal insulation with a high load carrying capacity.

GILSULATE®... the triple-zone insulation that fuses itself into lifetime protection for hot underground pipes. Water-proof, corrosion-proof, root-proof, acid/alkali-proof.

Compare your present insulation methods with Gilsulation:

1. Pour Gilsulate granules out of the bag onto the pipe; tamp it down.
2. Backfill: *the job is insulated!*

Gilsulate—nature's own insulation—is a unique, solidified hydrocarbon that virtually installs itself. Normal pipe-heat (up to 520°F) does the rest—fuses the Gilsulate to the pipe in hours, forming a massive circular solidified sheath.

Gilsulate costs less installed per linear foot *than any other underground pipe insulation*... it's easiest to use... and has been tested in scores of the country's largest and most important installations.

Some additional Gilsulate advantages:

- *3 grades available*—220° to 520° F
- *needs no sleeves* or mechanical sheaths
- *requires no mixing* or special handling
- *can't be punctured*—leave rocks in backfill
- *pipe expands and contracts* within Gilsulate structure
- *proved in actual use* in hundreds of new construction and replacement installations

Send coupon for descriptive literature.

AMERICAN GILSONITE COMPANY
SALT LAKE CITY, UTAH
Affiliate of Barber Oil Corp. & Standard Oil Co. of California

No skills necessary—simply pour Gilsulate out of 100 pound bags, tamp and backfill. Can be used under any and all conditions—no matter how many pipes, whatever the space.

GILSULATE®

THE TRIPLE-ZONE INSULATION
FOR LIFETIME PROTECTION
OF HOT UNDERGROUND PIPES.

American Gilsonite Company
134 West Broadway, Salt Lake City 1, Utah
or 1145 East Jersey Street, Elizabeth 4, N. J.

Please send me descriptive literature on Gilsulate.

NAME..

TITLE..

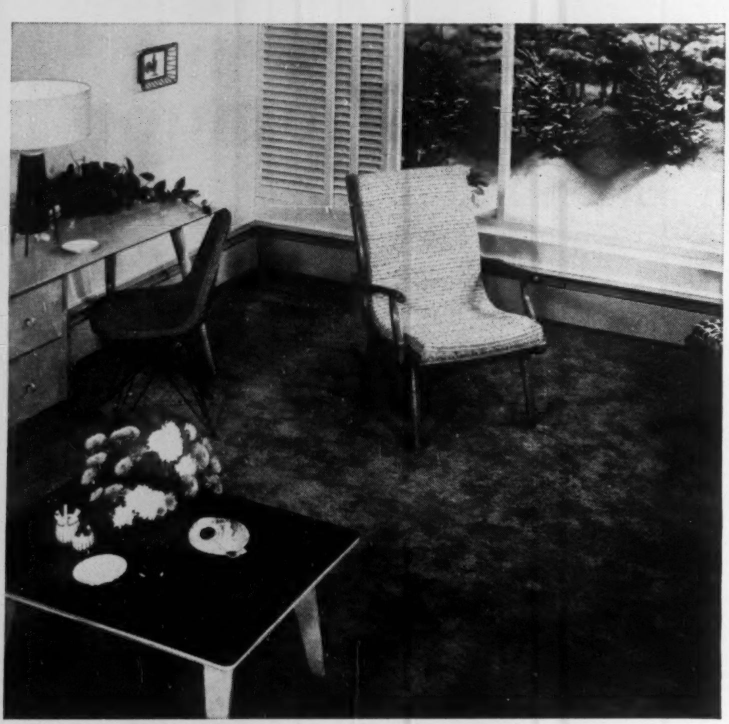
COMPANY..

ADDRESS..

HPC

Heatrim Panels by American-Standard offer you unlimited opportunities for increased sales and profits through

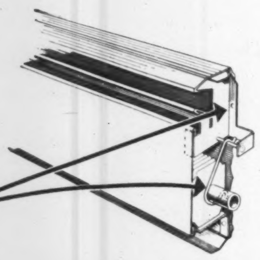
the Magic of Hot Water Comfort



HEATRIM PANELS are trim, efficient, correctly designed. They offer the outstanding features of convector heating for modern homes and buildings. These panels replace regular wooden baseboards, presenting a finished appearance along any wall length.

THE NEW HANGER
ON HEATRIM PANELS

This is a specially-designed combination support bracket and hanger. It permits maximum expansion of the heating element without noise, makes installation easier. Because of this improved design, it is possible to have longer straight run assemblies at minimum installation cost.



AMERICAN-Standard
HOT WATER HEATING

■ With today's overwhelming preference on the part of homeowners for clean, draft-free hot water heating, Heatrim baseboard panels offer you an exceptional product for boosting your business. For the magic of hot water comfort will attract more customers to you. And the attractive appearance and distinctive features of Heatrim panels by American-Standard will make selling quick and easy.

These popular-priced baseboard heating panels have been especially engineered for forced circulation hot water systems. They offer many economies in installation and operation. For example, since the heart of the element is actually a straight tube in which air is carried along with the water, air vents are not required and piping is held to a minimum. These sturdy panels are light weight and easy to handle. They reduce on-the-job costs because they come in individually-cartoned 6-foot lengths. Any needed length can thus be quickly and conveniently cut and connected.

Take advantage of the sizable market for these handsome, modern, space-saving Heatrim panels. Get in touch with your wholesaler now and order a supply to take care of your needs.

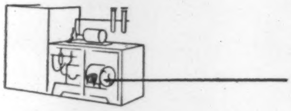
And ask your American-Standard sales office or wholesaler for a free copy of our booklet, "Selling the Magic of Hot Water Comfort"—or write to us direct. This booklet has scores of suggestions to help you sell more hot water heating equipment.

American Radiator & Standard
Sanitary Corporation,
P. O. Box 1226, Pittsburgh 30, Pa.

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

THE MARK OF EXTRA DEPENDABLE REFRIGERATION AND AIR CONDITIONING EQUIPMENT

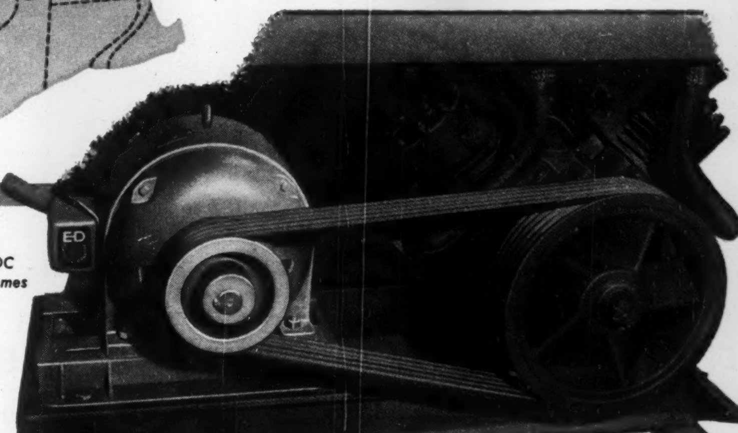
ED
ELECTRO DYNAMIC



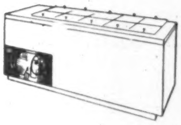
The red "power spot" on refrigeration or air conditioning equipment means *powered by Electro Dynamic,* the most dependable motors *ever* available to industry.

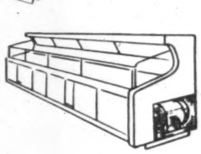
For *proof* of this *extra dependability* send the coupon below for your copy of **"MOTOR SHOWDOWN",** a new candid report on comparative results of motor performance tests* conducted in accordance with A. I. E. E. standards.

*Tests certified by J. Arthur Balmford, Professor of Electrical Engineering at a leading Eastern University.



1 to 250 hp., AC and DC
N.E.M.A. standard frames
All types of enclosures





ELECTRO
Extra
DYNAMIC
Dependable motors

ELECTRO DYNAMIC
Division of General Dynamics Corporation
150 Avenue A, Bayonne, New Jersey

ED
ELECTRO DYNAMIC
MOTOR SHOWDOWN

Please send me a copy of "MOTOR SHOWDOWN" and the new catalog of Electro Dynamic industrial motors.

NAME______________________________________

COMPANY___________________________________

ADDRESS___________________________________

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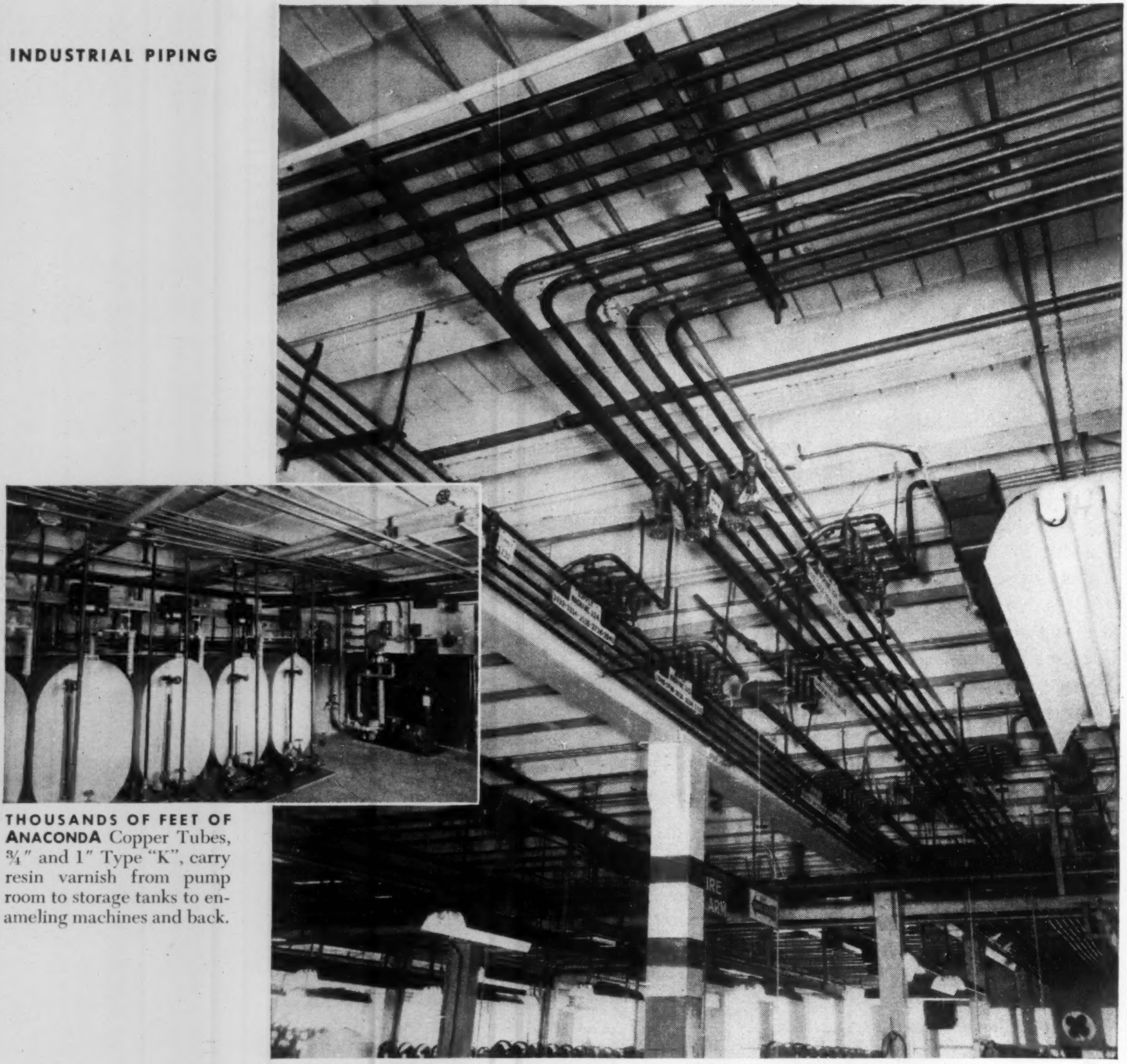
INDUSTRIAL PIPING



THOUSANDS OF FEET OF ANACONDA Copper Tubes, ¾″ and 1″ Type "K", carry resin varnish from pump room to storage tanks to enameling machines and back.

BENDS INTO STORAGE TANK feeder lines are easy with ANACONDA Copper Tubes.

THIS VARNISH-DISTRIBUTING SYSTEM STAYS CLEAN

It's copper . . . and a five-year check-up reveals no contamination

Resin varnish, kept constantly at 90 to 100°F to maintain low viscosity, has been pumped through these ANACONDA Copper Tubes for 5 years. The plant engineer of this leading wire manufacturer doesn't plan his next check-up for at least two more years. There have been no leaks . . . no shutdowns due to clogging. Periodic check-ups show no varnish contamination and, of course, with copper tubes there is no rust formation. Varnish flow is as steady today as when the piping was first used.

Pipelines of copper are economy pipe lines. Lightweight, available in long lengths and easily bent to by-pass obstructions, copper tubes permit inexpensive, speedy installations. The smooth bore of both copper tubes and wrought solder-type fittings means less flow resistance. Result: low pumping costs. Easy dismantling and high salvage value spell possible future savings, too, should plant layout be changed.

Publication C-24 offers many additional facts on how ANACONDA Copper Tubes can help improve product quality, reduce operating and maintenance costs and avoid costly shutdowns. Write to: *The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.*

5337

call your

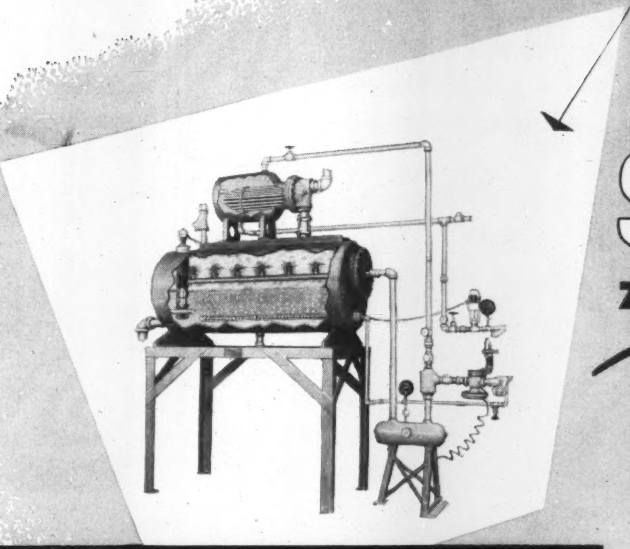
ANACONDA®

distributor for

Copper tubes and fittings for industrial process lines, water, heating and sanitary drainage systems • American Flexible Metal Hose and Tubing • American Vibration Eliminators.

a Fresh approach . . . a Major advance . . .

in boiler feedwater deaeration



SCHAUB

ZERO-OXYGEN

Deaerators

NEW DESIGN! NEW PERFORMANCE! NEW SAVINGS!

Complete Oxygen Removal (to .005 cc/liter) • Complete Safety and Dependability • Wide Range for Load Variations • High Thermal Economy • Low Maintenance Costs • Simpler Design for Trouble-Free Service

Start with an idea that's *basically* new and better. Then produce performance beyond the best that ordinary deaerators can deliver. Schaub engineers achieved it . . . developed the all-new deaerator that's a major advance in boiler feedwater deaeration!

Two basic differences give the Schaub Zero-Oxygen Deaerator its outstanding advantages . . . note them well. First, it provides *external* pre-heating to a temperature *above* boiling point, with over-atmospheric pressure held only up to the internal sprayer manifold! Second, a free, non-restricted vent liberates *all* air *immediately* with maximum vapor heat recovery!

From these simple fundamentals stems a whole series of all-important performance benefits. Every engineer or operating man concerned with boiler feedwater deaeration should have the full facts on all-new Schaub Zero-Oxygen Deaerators. Simply send the coupon to get the complete story — promptly.

FRED H. SCHAUB ENGINEERING COMPANY

2116 South Marshall Boulevard • Chicago 23, Illinois

SCHAUB
ZERO-OXYGEN
Deaerators

a Fresh approach . . . a Major advance
in boiler feedwater deaeration

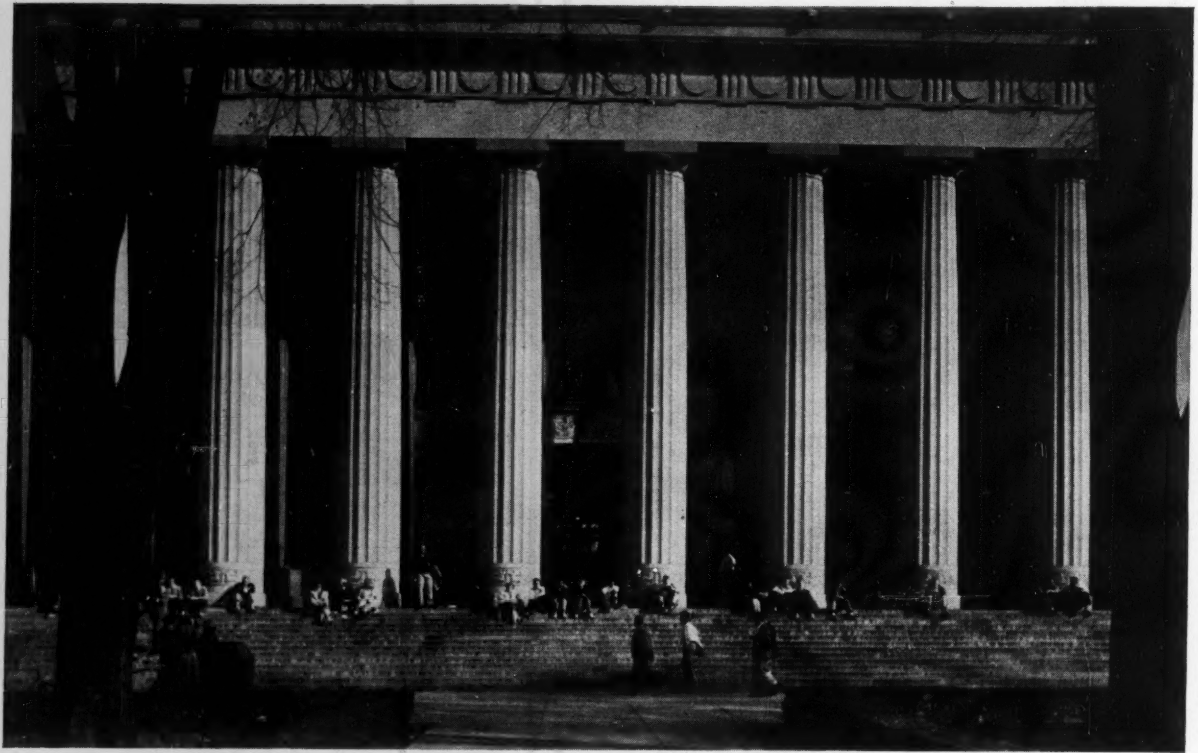
FREE FACTS!
SEND COUPON TODAY
FOR BULLETIN 575

Tells why you need deaeration. Explains basic differences in deaeration systems. Here's the complete story on new Schaub Zero-Oxygen Deaerators.

FRED H. SCHAUB ENGINEERING COMPANY
2116 South Marshall Boulevard, Chicago 23, Illinois

Please send me without cost or obligation, my personal copy of your new bulletin 575 on Boiler Feedwater Deaeration.

NAME______________________________
COMPANY____________________________
ADDRESS____________________________
CITY______________ZONE____STATE______



Michigan's Angell Hall is a popular meeting place for students.

American Blower goes to college

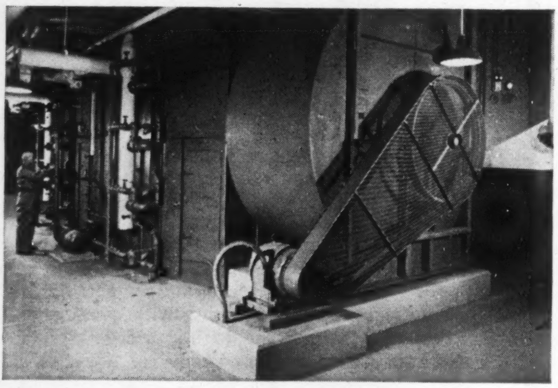
UNIVERSITY OF MICHIGAN uses American Blower air-conditioning and ventilating equipment in many of its campus buildings

Students from all parts of the globe come to Ann Arbor to attend the University of Michigan — world-famous center for higher education. Good ventilation is a must for student comfort in classrooms, lecture halls and residence halls.

For example, Angell Hall is the largest classroom building on the U. of M. campus. Every day, thousands of students attend classes here. Yet, throughout each day, rooms are comfortable and well ventilated — thanks to American Blower Supply and Exhaust Fans, Humidifiers and Heating Coils that are part of the building's conditioned-air system.

Other American Blower equipped buildings on campus are the Kresge Medical Research Building and Institute, Woman's Hospital, Outpatient Building, School of Public Health, Law Quadrangle, men's South Quadrangle Residence Hall — and many, many more!

American Blower engineers have a complete knowledge of the air cycle and the special problems of many industries. If you have an air-handling problem, phone your nearest American Blower or Canadian Sirocco Branch Office.



Each of the five Air-Tempering Units in Angell Hall consists of an HS Supply Fan (rated 58,425 cfm), a Capillary Air Washer and Heating Coils. American Blower equipment in other U. of M. buildings includes: Supply and Exhaust Fans, Capillary Air Washers, Heating Coils, Venturafin Unit Heaters, Nesbitt Syncretizers, Forced- and Induced-Draft Fans.

AMERICAN BLOWER

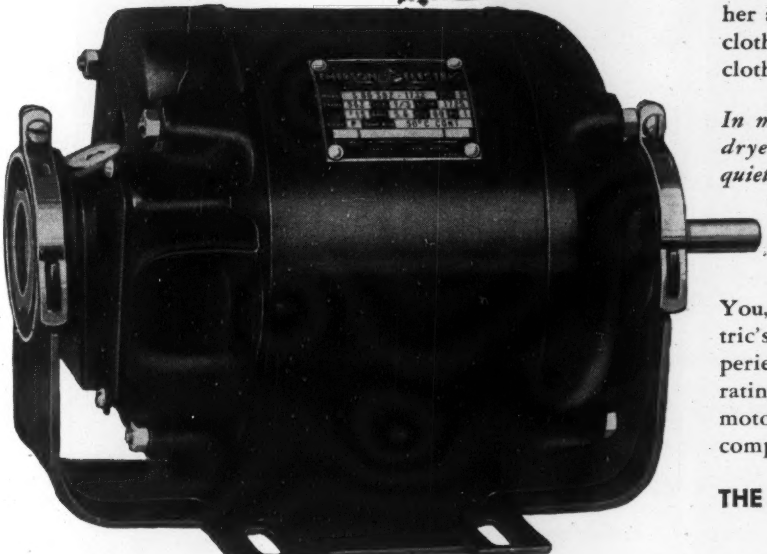
AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary Corporation

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

music to her ears!

A sweet note to the ears of the modern homemaker is the low, efficient hum of her automatic clothes dryer. Clothes lines, clothes pins and a damp basement full of clothes are no longer necessary.

In many of America's best known clothes dryers, an Emerson-Electric motor works quietly and efficiently.



You, too, can benefit from Emerson-Electric's 63 years of motor manufacturing experience. If you require standard motors in ratings from 1/20 to 5 h.p., or hermetic motors from 1/8 to 20 h.p., write for complete information.

THE EMERSON ELECTRIC MFG., CO.
St Louis 21, Mo.

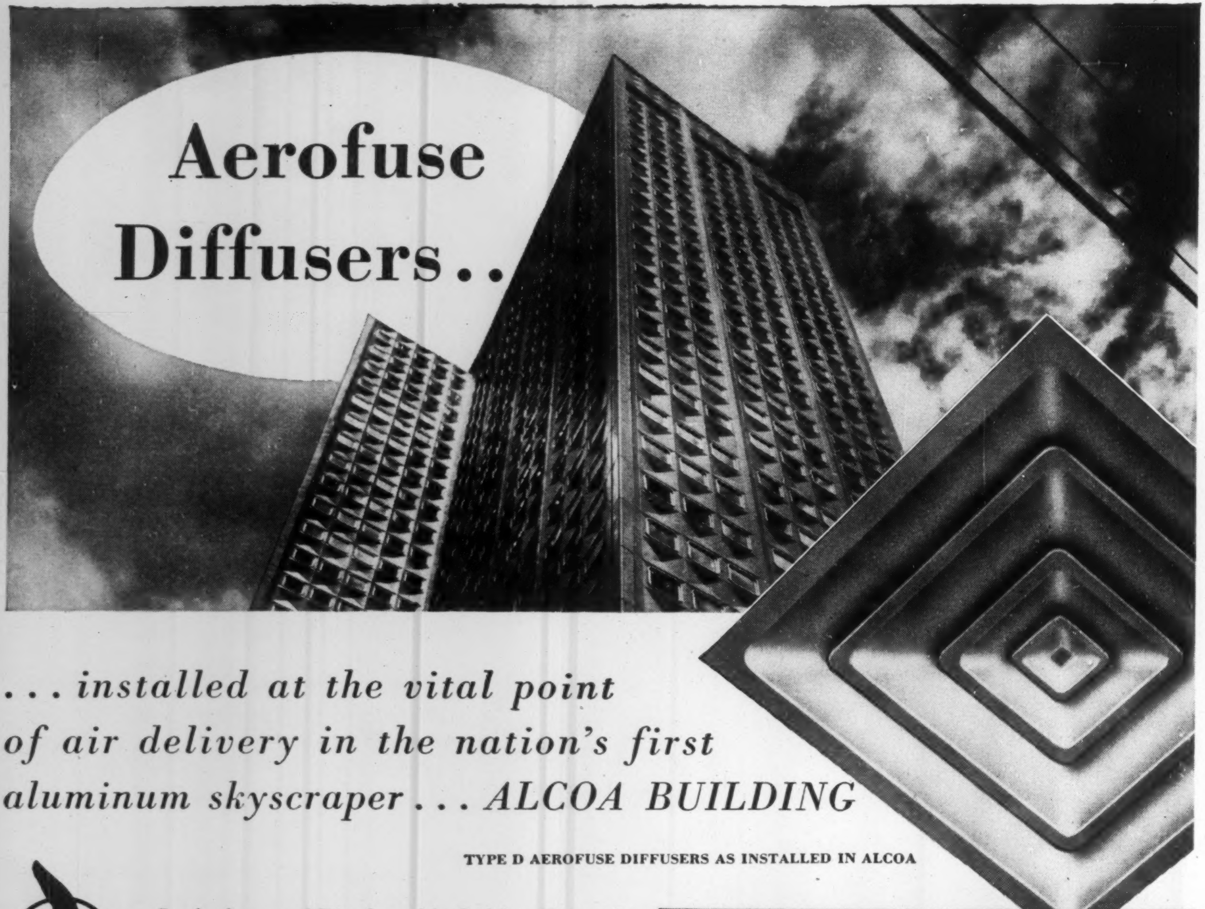
Write for these Emerson-Electric Motor Data Bulletins

Manufacturers requiring motors 1/20 to 5 h.p. can profitably use these reference guides. Specifications, construction and performance data are included for these motors:

☐ 486-A Capacitor-Start
☐ 486-B Split-Phase
☐ 486-C Integral
☐ 486-D Fan-Duty
☐ 486-E Oil-Burner
☐ 486-F Jet Pump
☐ 486-G Blower

EMERSON ELECTRIC
MOTORS • FANS APPLIANCES

Aerofuse Diffusers . .



. . . installed at the vital point of air delivery in the nation's first aluminum skyscraper . . . ALCOA BUILDING

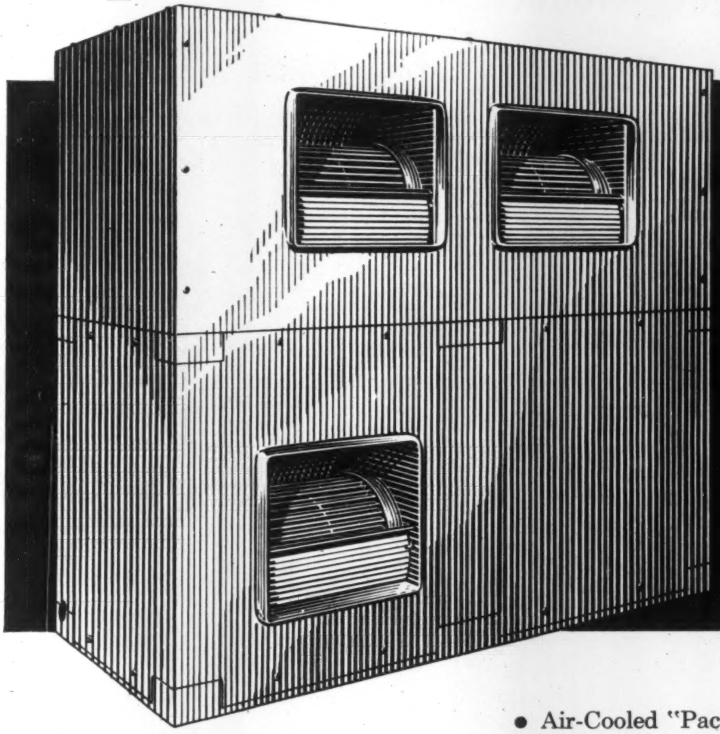
TYPE D AEROFUSE DIFFUSERS AS INSTALLED IN ALCOA

In the heart of Pittsburgh's Golden Triangle, the gleaming Alcoa Building rises thirty floors, a dramatic new concept in multi-story building design and construction. In Alcoa, as in other outstanding buildings from coast to coast — where the efficient performance and attractive appearance of air distribution equipment must meet rigid engineering and architectural specifications — Aerofuse Diffusers were selected for installation at the *vital point of air delivery.*

TUTTLE & BAILEY inc

NEW BRITAIN, CONNECTICUT

1 *of the many reasons why you will find it pays to sell Chrysler Airtemp*



Another Chrysler Airtemp "First"...

AIR-COOLED
"PACKAGED" AIR CONDITIONING

now offers you and your prospects

many big advantages!

• Air-Cooled "Packaged" Air Conditioning, pioneered by Chrysler Airtemp, already tested and proved in a wide variety of commercial installations, operates entirely without water—uses only air and electricity. It makes air conditioning practical for businesses which have problems of water supply, water expense or water disposal—thus increasing your market tremendously.

Air-Cooled Air Conditioning in Chrysler Airtemp's compact package costs you less to install because no plumbing is necessary. Wherever installed, it will cost your customers less to maintain.

Air-Cooled "Packaged" Air Conditioners, in 2, 3 and 5 horsepower sizes, supplement the long-established Chrysler Airtemp line of six water-cooled models, 2 through 15 horsepower. They constitute an important new reason why it will pay you to sell Chrysler Airtemp. Check the additional reasons listed at left. Then fill in and mail the coupon for complete details!

7 *more advantages you sell with when you sell Chrysler Airtemp . . .*

- **Consumer Confidence**—people know the Chrysler Airtemp name—associate it with engineering leadership—have confidence in the products which carry it.
- **Lower Installation Cost**—super-quiet operation permits use within or very close to areas to be cooled, reducing amount of ductwork required. All units shipped completely factory-assembled and tested.
- **Assured Dependability**—Chrysler Airtemp pioneered "Packaged" Air Conditioning in 1937, has more units in use today than anybody else. All units are manufactured to exacting standards of precision in a modern, windowless, completely air conditioned factory.
- **Advanced Engineering** by Chrysler Airtemp offers your customers features that mean more because they do more for them.
- **5-Year Compressor Warranty**—covers replacement of compressor, freight and labor.
- **More National Advertising**—6 big campaigns reaching all prospects for air conditioning; 22 campaigns in trade journals constantly selling the particular benefits of Chrysler Airtemp "Packaged" Air Conditioning to individual businesses and professions which make up your most important markets.
- **More Local Selling Helps**—the broadest line of tested and proved local selling helps for dealers.

Guaranteed by Good Housekeeping

CHRYSLER AIRTEMP

heating • air conditioning for homes, business, industry

Airtemp Division, Chrysler Corporation, Dayton 1, Ohio

Airtemp Division, Chrysler Corporation HP&AC-4-54
P.O. Box 1037, Dayton 1, Ohio
I would like to know more about the Chrysler Airtemp Franchise.

Name________________________________

Address______________________________

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the best running mate your product can have–

DELCO MOTORS

With exceptionally long life and outstanding quality built in . . . with worldwide recognition and acceptance—a Delco motor adds a unique plus value to any product it serves.

Delco fractional and integral motors are readily available in a wide range of sizes to assure you of the best running mate *your* product can have.

DELCO PRODUCTS

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SALES OFFICES:
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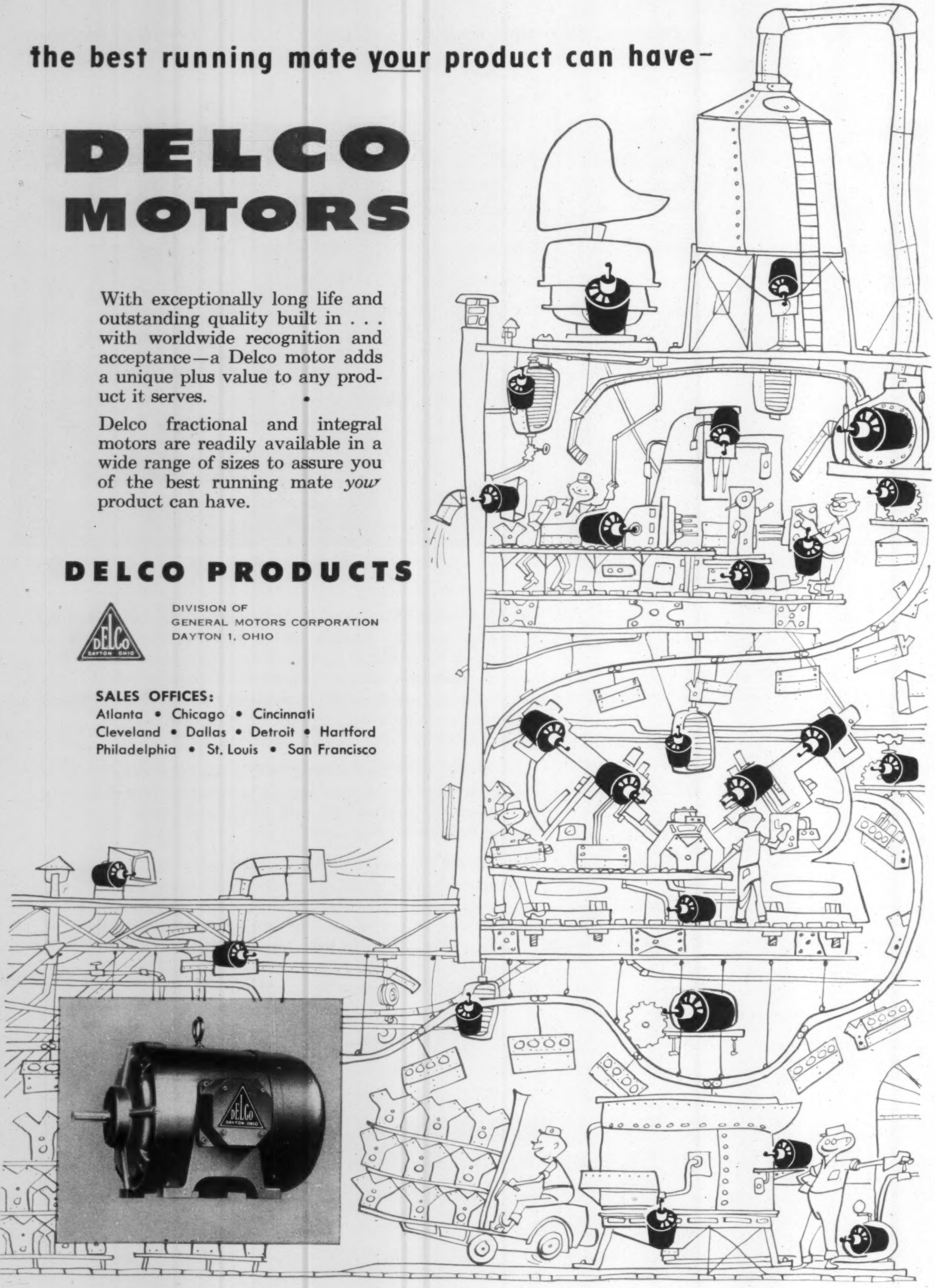
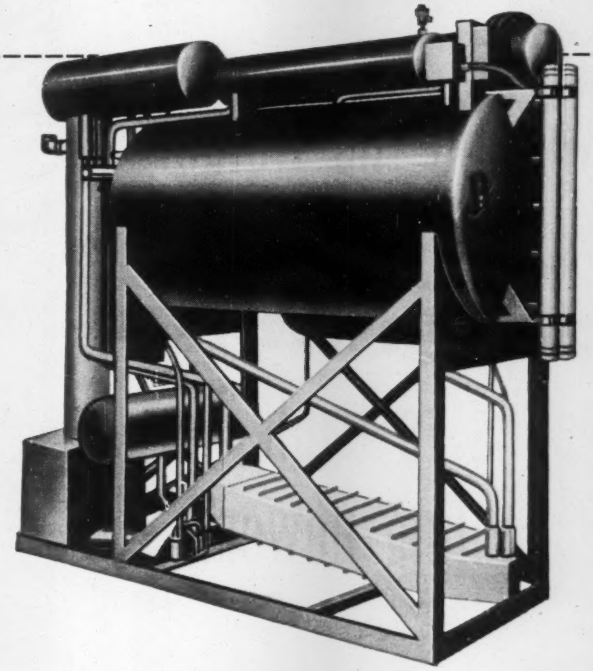


Solve cooling problems with waste heat or low-cost steam!



FLEXIBLE
SERVEL
WATER CHILLER

meets all 3
cooling needs

1. AIR CONDITIONING

The adaptable Servel 25-ton Water Chiller—operating on any source of steam—uses water as the refrigerant to provide economical temperature and humidity control in large buildings and factories. No expensive duct systems are required!

2. PROCESS COOLING

Because it operates with no moving parts on the time-proved absorption refrigeration principle, you can depend upon the Servel 25-ton Water Chiller for continuous high-efficiency cooling of liquids for various manufacturing and formulating processes.

3. INDUSTRIAL PRECOOLING

You can use the unusually flexible Servel 25-ton Water Chiller to precool air for increased capacity and improved performance of air compressors and internal combustion machines. The Water Chiller also serves other money-saving precooling purposes.

5-YEAR WARRANTY! Every Servel 25-ton Water Chiller is backed by a full 5-year warranty. Because it has no moving parts, the Servel Water Chiller operates quietly and without vibration. Add to these advantages its extremely compact size and light floor weight and you'll appreciate why it can be installed on any floor with most economical piping arrangement. May be installed singly or in multiple as required. Mail the coupon below today for complete information.

Servel

the name to watch for great advances in . .
AIR CONDITIONING ✓ REFRIGERATION

MAIL THIS COUPON TODAY

SERVEL, INC., Dept. HP-44, Evansville 20, Indiana

Please send me further information about application flexibility of the Servel 25-ton Water Chiller.

Name____________________

Firm____________________

Address____________________

City__________Zone____State__________

Why did the Waldorf choose TYPHOON coils to triple its cooling power?

Tom Barrett gives his Typhoon installation an approving once-over.

Tom Barrett, Building Superintendent of the Waldorf-Astoria, found himself with a whale of a problem.

Seems that when the original air conditioning system was installed in the Grand Ballroom, over 15 years ago, they didn't reckon with full capacity crowds or the hot blasts of TV lights.

Now, the capacity of the air handling equipment had to be tripled in order to cool the ballroom adequately.

This called for the installation of banks of chilled water cooling coils with new blower systems. To complicate matters, larger quantities of outside air brought in for ventilation purposes required new banks of pre-heating and heating coils.

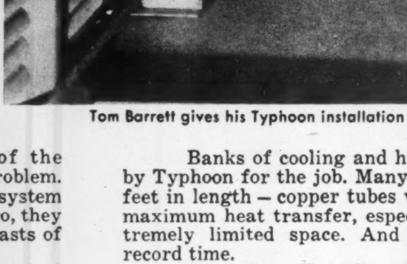
The consulting engineers, Seelye, Stevenson, Value & Knecht, looked about for a firm that could supply custom-built coils meeting the rigid standards of quality prescribed by this world-famous hotel. After exhaustive checking of qualifications and past performance records, one firm stood out – Typhoon.

Banks of cooling and heating coils were tailor-made by Typhoon for the job. Many were 8 rows in depth and 10 feet in length – copper tubes with helically bonded fins for maximum heat transfer, especially designed to fit into extremely limited space. And Typhoon made delivery in record time.

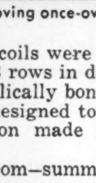
Now it's really a Grand Ballroom—summer and winter—with enough dependable cooling to accommodate the full capacity of 3000. Tom Barrett is satisfied that the rugged equipment standards of the Waldorf have been met—and then some. "Those Typhoon 8-row coils really wring out the moisture," he says happily.

And so another great name is added to the long list of famous Typhoon customers.

Whether the job calls for a single packaged air conditioning unit or a custom-built central plant—you can count on Typhoon. Quality engineering, backed by over 40 years of experience, is your guarantee of trouble-free performance.



Packaged Air Conditioning
Units in 2-3-5-7½-10-15-20-25 horsepower sizes



Packaged Water Chillers
10 and 20 horsepower

TYPHOON
AIR CONDITIONING

Write for detailed information
TYPHOON AIR CONDITIONING CO., INC.
794 Union Street, Brooklyn 15, N. Y.
Specialists in Air Conditioning Since 1909

A NEW DEVELOPMENT
OF
ARMSTRONG RESEARCH

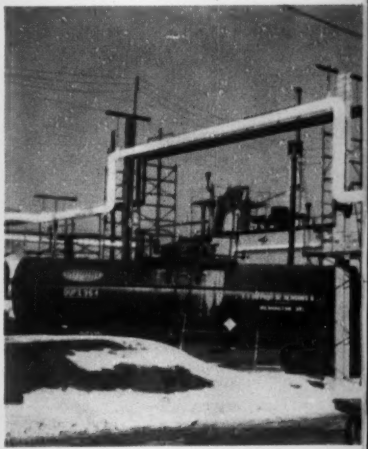
Insulcolor . . . *a new plastic finish for insulated lines, tanks, ducts, and cold rooms*

Here's a new kind of insulation finish that also serves as color identification. It's Armstrong's Insulcolor, a newly developed plastic coating for use on high- and low-temperature installations in either indoor or outdoor locations.

Armstrong's Insulcolor dries to a smooth, attractive finish that is rugged and durable. It will withstand a wide range of temperatures without cracking or crazing. Insulcolor is both fire and moisture resistant, easy to maintain.

It is quickly and easily applied, eliminating many of the steps required with standard finishing methods. Available in a choice of seven colors and white, Armstrong's Insulcolor cuts the expense of additional painting of insulation surfaces for identification or decoration.

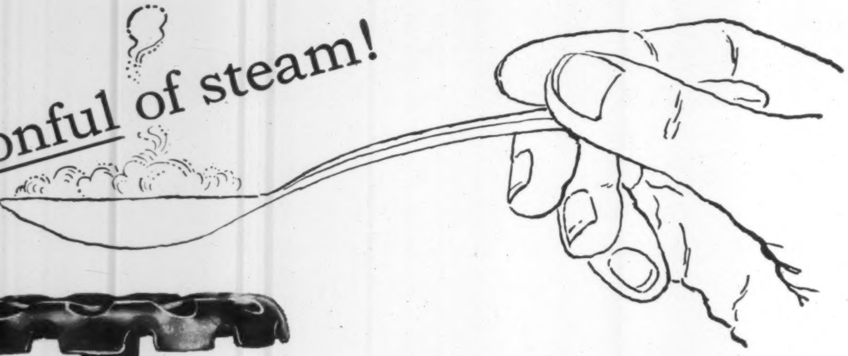
Insulcolor is another example of ways Armstrong's research is developing insulation materials and methods that simplify application, reduce costs. For full details on Insulcolor and Armstrong's Complete Contract Service, call your nearest Armstrong office or write Armstrong Cork Company, 201 Stratton St., Lancaster, Pennsylvania.



Insulcolor's rugged properties give it the durability needed to withstand severe outdoor service. In the photo above, white Insulcolor has been applied to an overhead line at one of the plants of E. I. du Pont de Nemours and Company, Inc.

ARMSTRONG'S INDUSTRIAL INSULATIONS

a teaspoonful of steam!



TRADE
LESLIE
MARK
LYNDHURST, N.J
1/2
LCB
300
1/2

HERE'S THE ANSWER TO YOUR SMALL FLOW CONTROL PROBLEMS

a NEW REDUCING VALVE

for accurate, foolproof regulation of small flows of steam, air, gas or liquids, with inlet pressures to 1000 psi and reduced pressures from 2 to 400 psi.

Change operating conditions quickly and easily with simple, handwheel adjustment —no need to waste time changing springs or swapping parts. Check these widely accepted Leslie features that are standard in the new, efficient, Leslie Small Flow Reducing Valve.

Check these Features

- ✓ Simple, compact construction
- ✓ Top quality materials
- ✓ Metal Diaphragm
- ✓ Entirely enclosed—no stuffing boxes
- ✓ Corrosion resistant springs
- ✓ Hardened stainless steel valve
- ✓ Interchangeable inner valves

SEND FOR DESCRIPTIVE BULLETIN 511-A WITH *COMPLETE* CAPACITY TABLES

Before you order—

The new Class LCB is just one of the many units that are *special* with most manufacturers but are *standard* with Leslie.

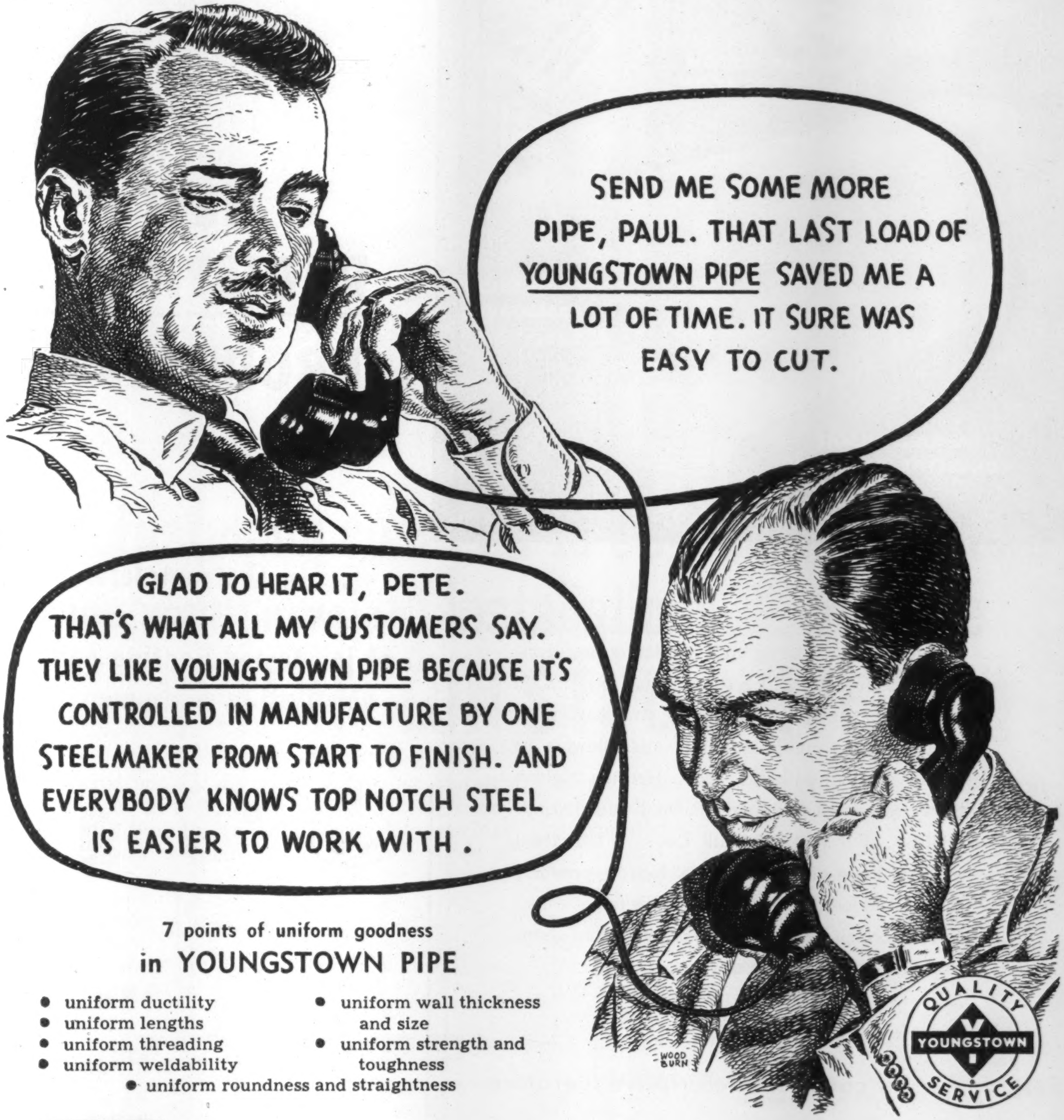
Check to see if any pressure, temperature or level control you want is standard with Leslie, before you order. Play it safe. Your Leslie Engineer is listed under "Valves" or "Regulators" in the classified telephone directory in principal cities.

TRADE
LESLIE
MARK

THE FIRST NAME IN PRESSURE, TEMPERATURE AND LEVEL CONTROLS
Since 1900

LESLIE CO., 237 Grant Avenue, Lyndhurst, New Jersey

Contractor calls for YOUNGSTOWN PIPE


SEND ME SOME MORE PIPE, PAUL. THAT LAST LOAD OF YOUNGSTOWN PIPE SAVED ME A LOT OF TIME. IT SURE WAS EASY TO CUT.
GLAD TO HEAR IT, PETE. THAT'S WHAT ALL MY CUSTOMERS SAY. THEY LIKE YOUNGSTOWN PIPE BECAUSE IT'S CONTROLLED IN MANUFACTURE BY ONE STEELMAKER FROM START TO FINISH. AND EVERYBODY KNOWS TOP NOTCH STEEL IS EASIER TO WORK WITH.
WOODBURN
QUALITY
YOUNGSTOWN
SERVICE

7 points of uniform goodness

in YOUNGSTOWN PIPE

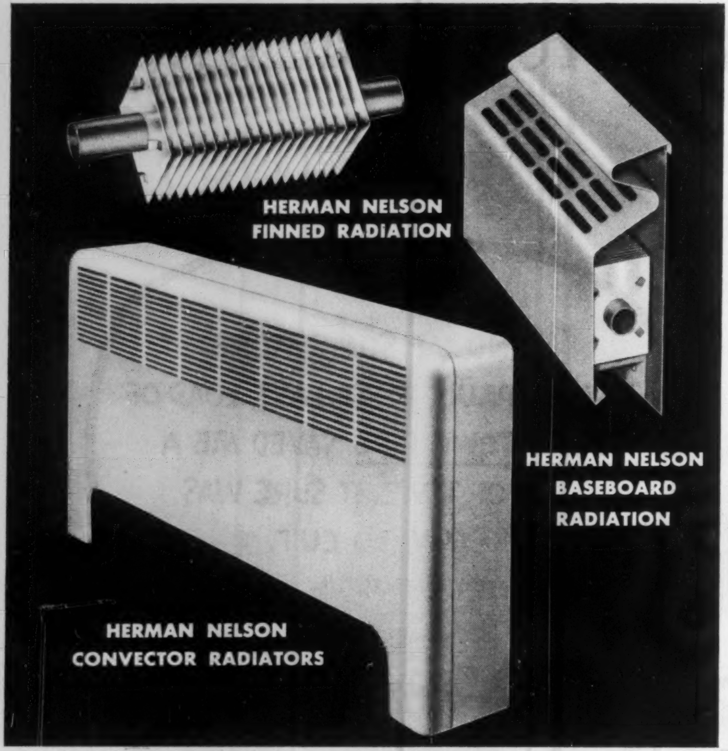
- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness

Youngstown STEEL PIPE

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices: Youngstown, Ohio - Export Office: 500 Fifth Avenue, New York 36, N. Y.

PIPE AND TUBULAR PRODUCTS - CONDUIT - BARS - RODS - COLD FINISHED CARBON AND ALLOY BARS - SHEETS - PLATES - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - RAILROAD TRACK SPIKES

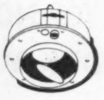


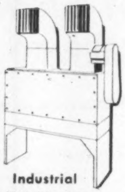
NOW...

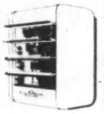
3 NEW RADIATION PRODUCTS

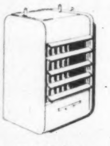
...in the complete HERMAN NELSON LINE of job-tested heating and ventilating equipment

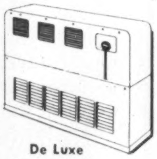
Whatever your heating and ventilating problems, Herman Nelson engineers have your answer. All under the same family name, you have unit heaters, fans, ventilating units and blowers to satisfy every installation need. Herman Nelson units are known for their efficiency and dependability . . . but that's not all! Look at the clean, modern lines of the Herman Nelson products shown—added reason to specify this famous line. Select Herman Nelson for 100% satisfaction, both to yourself and your clients.

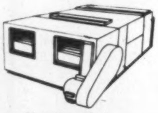

Vertical Unit Heater

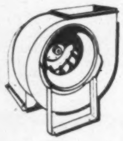

Industrial Unit Heater

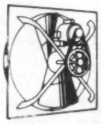

Horizontal Unit Heater


Gas-Fired Unit Heater


De Luxe Unit Heater


Heating and Ventilating Unit

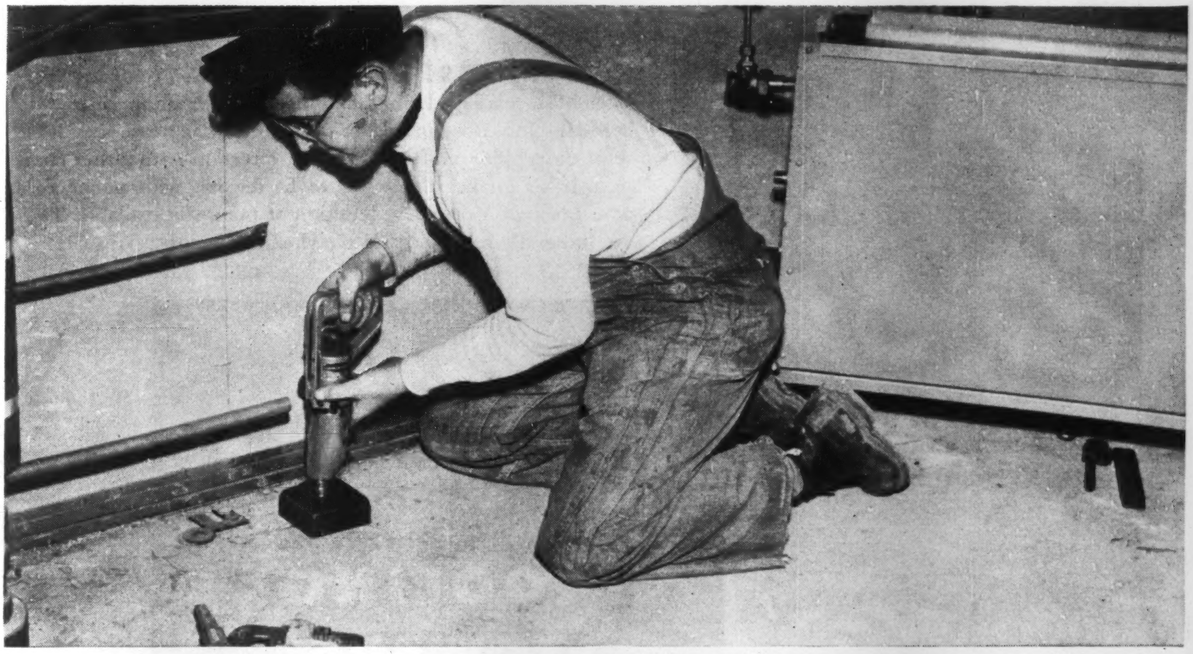

Unit Blower


Propeller Fan

Send today for complete descriptive literature

AAF® **American Air Filter**
COMPANY, INC.
373 Central Avenue
Louisville 8, Ky.

herman nelson



Cut fastening costs up to 80% on heating and air conditioning installations... with the

REMINGTON STUD DRIVER

"It saves us money on every fixture we install" —that's the kind of report we're getting every day on the Remington Stud Driver. Big savings just naturally result from the amazing speed of this powder-actuated tool. It sets as many as 5 studs a minute in steel or concrete!

You'll find real economy, too, in the fact that the Stud Driver is completely self-powered—no need for extra equipment, wires or cables. Compact and portable, the tool is designed in every way for easy handling. And since it weighs only 6 pounds, it's ideal for working overhead and in confined spaces.

What's your fastening job? Whether it's fastening pipe to walls and ceilings or anchoring fixtures to concrete floors, you'll save money with the Remington Stud Driver. For complete information on how to cut *your* fastening costs, just send in the coupon below.

QUESTIONS YOU ARE ASKING

QUESTION:

What are the studs made of?

ANSWER:

Genuine Remington studs are made of a selected molybdenum-bearing alloy steel, heat-treated for required hardness and ductility properties. All are plated for protection against corrosion.

"If It's Remington—It's Right"

LISTED UNDER REEXAMINATION SERVICE OF UNDERWRITERS' LABORATORIES, INC. UL

Remington DU PONT

Listed & Approved by Underwriters' Laboratories, Inc.

MAIL THIS COUPON TODAY

REMINGTON
STUD DRIVER

Industrial Sales Division, Dept. HPAC-4
Remington Arms Company, Inc.
Bridgeport 2, Connecticut

Please send me free copies of the new booklets showing how I can cut my fastening costs.

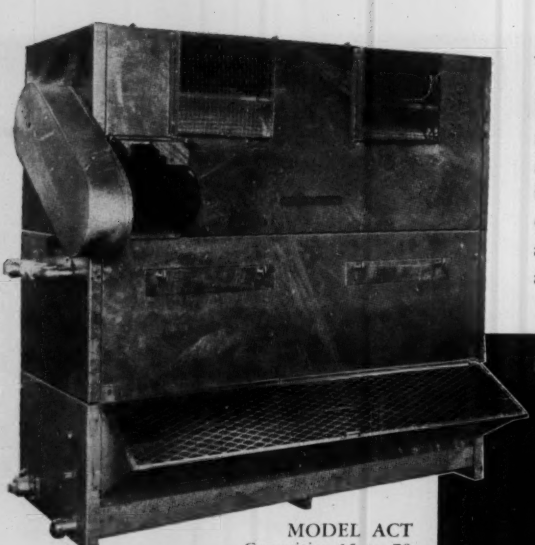
*Name*____________________

*Position*____________________

*Firm*____________________

*Address*____________________

*City*____________ *State*____________



MODEL ACT
Capacities 15 to 70
tons. 25 ton unit shown.

ease of installation: Acme's compact, preassembled, packaged units simplify field erection since they are ready for either indoor or outdoor service when they leave the factory; choice of air discharge direction with either front or rear air intake allows you to fit the job with minor field adjustments. A complete selection of pumps is available. They are integrally mounted and piped at the factory.

Acme

has what you are looking for in

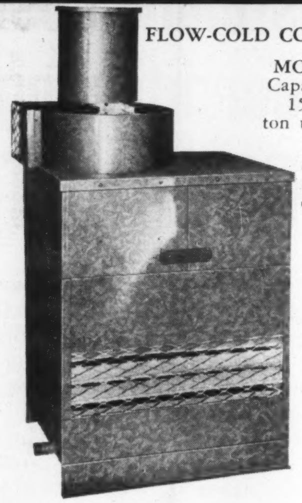
COOLING TOWERS

top performance: Induced draft by means of centrifugal type fan wheels, dynamically balanced for smooth, quiet, efficient operation, assures constant capacity at all times regardless of wind conditions.

Acme's heavy duty all metal eliminators produce maximum changes in direction of air flow while removing entrained water droplets with low static loss. The new heavy gauge steel "Acme-Pak" is designed to provide the maximum in cooling effect.

Both the eliminator and pack are encased in a tight fitting exterior framework resulting in quiet operation and the prevention of air leakage, assuring efficient performance.

durability: Acme's completely galvanized construction of heavy gauge steel and die formed structural panels provides extra strength, extreme rigidity, freedom from vibration and long trouble-free life.



FLOW-COLD COOLING TOWER

MODEL JCT
Capacities 3 to
15 tons. 5
ton unit shown.

Stocked throughout the country by quality wholesalers

ACME INDUSTRIES, INC.

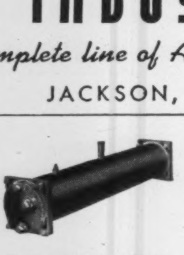
Mfgs. of a complete line of Air Conditioning and Refrigeration Equipment

JACKSON, MICHIGAN

Evaporative Condensers
Cooling Towers
Floor-type Unit Coolers

Direct Expansion (Dry-Ex) and Flooded Liquid Chillers

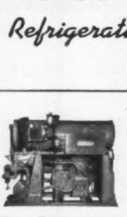
Heat Exchangers, Oil Separators



Shell and Tube, Shell and Coil Condensers

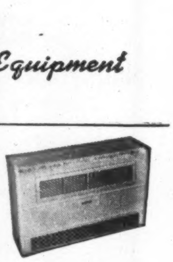
Receivers, Pipe Coils

Packaged Liquid Chillers to 225 tons



Flow-Temp Heat Pumps

Flow-Cold Liquid Chillers



Remote Room Conditioner

Continuously serving the air conditioning and refrigeration industry since 1919

6" S10 TF TAYLOR FORGE WELDELL WPBHT-TR2
PAT.

There is a difference in return bends—

Making a seamless return bend is no simple task. Holding it to the unvarying accuracy and metallurgical uniformity found in 180° WeldELLS® is a feat that could be accomplished only by the organization that pioneered the seamless return bend and perfected it through a quarter century of specialization.

Every WeldELL return bend gives you exactly what you ordered: true roundness, accurate size, full pipe thickness from end to end . . . controlled quality all the way through. No fitting tells the WeldELL story better than the return bend. There *IS* a difference!

And there *IS* a difference in *all* Taylor Forge Welding Fittings. It is a difference that is particularly important now that fittings made to low standards have come into the market. Today the best way to be sure you are getting welding fittings of highest quality, conforming to all codes and standards, is to specify Taylor Forge WeldELLS.

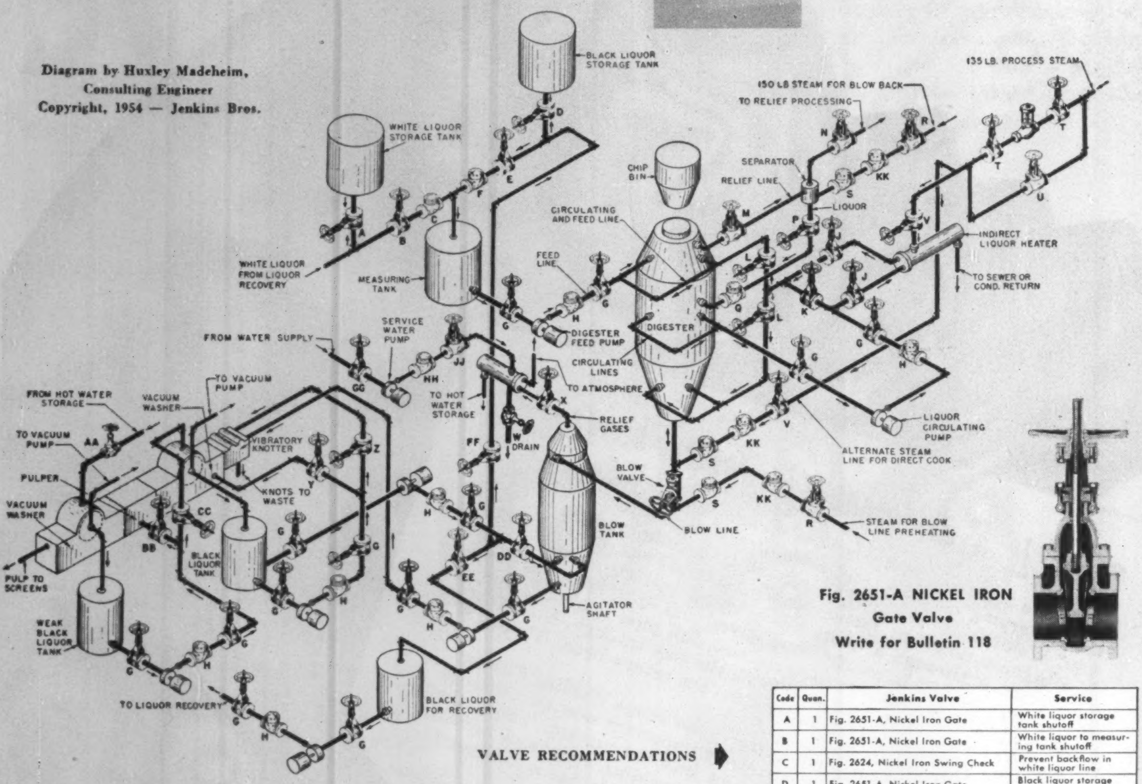
WeldELLS—the *first* complete line—is still the *most* complete line, in range of types, sizes, weights, materials. For up-to-the-minute facts see your Taylor Forge Distributor.

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS, General Offices and Works: P.O. Box 485, Chicago 90, Ill.
Offices in all principal cities. Plants at: Carnegie, Pa.; Fontana, Calif.; Gary, Ind.; Hamilton, Ont., Canada

JENKINS PRACTICAL PIPING LAYOUTS 72

Diagram by Huxley Madeheim,
Consulting Engineer
Copyright, 1954 — Jenkins Bros.


BLACK LIQUOR STORAGE TANK
WHITE LIQUOR STORAGE TANK
WHITE LIQUOR FROM LIQUOR RECOVERY
MEASURING TANK
CHIP BIN
CIRCULATING AND FEED LINE
FEED LINE
DIGESTER
DIGESTER FEED PUMP
CIRCULATING LINES
TO ATMOSPHERE
RELIEF GASES
SERVICE WATER PUMP
FROM WATER SUPPLY
TO HOT WATER STORAGE
DRAIN
TO VACUUM PUMP
FROM HOT WATER STORAGE
VACUUM WASHER
TO VACUUM PUMP
VIBRATORY KNOTTER
KNOTS TO WASTE
PULPER
VACUUM WASHER
PULP TO SCREENS
BLACK LIQUOR TANK
WEAK BLACK LIQUOR TANK
TO LIQUOR RECOVERY
BLACK LIQUOR FOR RECOVERY
BLOW TANK
AGITATOR SHAFT
BLOW VALVE
BLOW LINE
STEAM FOR BLOW LINE PREHEATING
ALTERNATE STEAM LINE FOR DIRECT COOK
LIQUOR CIRCULATING PUMP
135 LB. PROCESS STEAM
150 LB STEAM FOR BLOW BACK
TO RELIEF PROCESSING
SEPARATOR
RELIEF LINE
LIQUOR
INDIRECT LIQUOR HEATER
TO SEWER OR COND. RETURN
A
B
C
D
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HH
JJ
KK

Fig. 2651-A NICKEL IRON
Gate Valve
Write for Bulletin 118

VALVE RECOMMENDATIONS ➧

Code	Quan.	Jenkins Valve	Service
A	1	Fig. 2651-A, Nickel Iron Gate	White liquor storage tank shutoff
B	1	Fig. 2651-A, Nickel Iron Gate	White liquor to measuring tank shutoff
C	1	Fig. 2624, Nickel Iron Swing Check	Prevent backflow in white liquor line
D	1	Fig. 2651-A, Nickel Iron Gate	Black liquor storage tank shutoff
E	1	Fig. 2651-A, Nickel Iron Gate	Shutoff black liquor to measuring tank
F	1	Fig. 2624, Nickel Iron Swing Check	Prevent backflow in black liquor line
G	14	Fig. 2651-A, Nickel Iron Gate	Liquor Pump shutoff
H	7	Fig. 2624, Nickel Iron Swing Check	Prevent backflow through pump
J	2	Fig. 2651-A, Nickel Iron Gate	Liquor heater shutoff
K	1	Fig. 2651-A, Nickel Iron Gate	Liquor heater bypass
L	2	Fig. 2651-A, Nickel Iron Gate	Liquor circulating line shutoff
M	1	Fig. 1317, Stainless Steel Globe	Digester relief control
N	1	Fig. 1317-A, Stainless Steel Globe	Control flow of relief gas
P	1	Fig. 2651-A, Nickel Iron Gate	Shutoff liquor from separator
Q	1	Fig. 1331, Stainless Steel Swing Check	Prevent backflow to separator
R	2	Fig. 1040, Cast Steel Globe	Control steam flow
S	3	Fig. 1331, Stainless Steel Swing Check	Prevent liquor flow to steam line
T	2	Fig. 1009, Cast Steel Gate	Control valve shutoff
U	1	Fig. 1040, Cast Steel Globe	Control bypass steam
V	2	Fig. 1009, Cast Steel Gate	Steam shutoff
W	1	Fig. 106-A, Bronze Globe	Drain line control
X	1	Fig. 1307-A, Stainless Steel Gate	Blow tank vent shutoff
Y	1	Fig. 2651-A, Nickel Iron Gate	Black liquor shutoff to washer pan
Z	1	Fig. 2651-A, Nickel Iron Gate	Black liquor shutoff to knotter
AA	1	Fig. 106-A, Bronze Globe	Control water to wash spray
BB	1	Fig. 2651-A, Nickel Iron Gate	Black liquor shutoff to pulper
CC	1	Fig. 2651-A, Nickel Iron Gate	Black liquor shutoff to wash spray
DD	1	Fig. 2651-A, Nickel Iron Gate	Black liquor shutoff to blow tank
EE	1	Fig. 2651-A, Nickel Iron Gate	Black liquor shutoff to recovery
FF	1	Fig. 2651-A, Nickel Iron Gate	Black liquor shutoff to storage
GG	1	Fig. 651-A, I.B.B.M. Gate	Service water pump shutoff
HH	1	Fig. 624, I.B.B.M. Swing Check	Prevent backflow through pump
JJ	1	Fig. 613, I.B.B.M. Globe	Control water supply
KK	3	Fig. 1025, Cast Steel Swing Check	Steam line check

How to plan a SULPHATE PULPING PROCESS SYSTEM

Chemical treatment begins when chips, conveyed to the digester, are cooked in an alkaline solution of sodium sulphide and caustic soda. The residual spent solution (black liquor) is used in subsequent processing, or is restored to its original state in a chemical recovery cycle. The resultant economy is an important advantage of the sulphate process.

The digester fluid is prepared by combining the alkaline solution, either new or recovered (white liquor), with black liquor from the digester discharge, in a predetermined ratio. This blended liquor is pumped into the digester simultaneously with the chips. A liquor circulating pump thoroughly agitates the mixture, and liquor drawn from the center of the digester bypasses the indirect liquor heater and is returned to the bottom of the digester. When the charge is completed, the digester is closed, and the cooking begins.

An indirect heater is used for cooking in sulphate pulping, generally, to prevent excessive dilution of the liquor. This layout also shows an alternate steam line for direct cooking.

When the cooked mixture is ready for removal, the blow valve is opened and the charge is transferred to the blow tank where it is washed and cooled.

In a series of vacuum washers, the pulp is forced onto revolving drums. As the drum revolves, the pulp is washed by sprays. From the last washer, it goes to the paper making process.

Black liquor collected from the first washer is stored for re-use in the digester, pumped to the blow tank for washing the pulp, or pumped to the recovery cycle for conversion to white liquor. This recovery process will be described in a later Jenkins Layout.

Jenkins Nickel Iron Gates and Checks with Stainless Steel Trim are recommended in this system, for valves in contact with black or white liquor.

Consultation with accredited piping engineers and contractors is recommended when planning any major piping installation.

To simplify planning, select all the valves you need from the complete Jenkins line. It's your best assurance of *lowest cost in the long run.* Jenkins Bros., 100 Park Ave., New York 17. Sold through leading Industrial Distributors everywhere.

Complete description and enlarged diagram of this layout free on request. Includes additional detailed information. Ask for Piping Layout No. 72.

JENKINS
LOOK FOR THE DIAMOND MARK
VALVES
SINCE 1864
TRADE JENKINS MARK

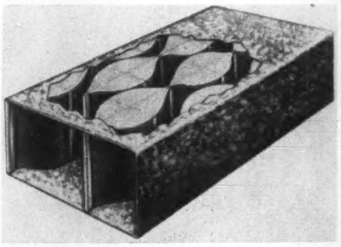
Jenkins Bros

EQUIPMENT DEVELOPMENTS...

Add the new products and companies listed here to your Directory Section which you received in your January 1954 Heating, Piping & Air Conditioning, and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section; double asterisk, equipment and manufacturer not listed.

Silencing Noise in Ducts

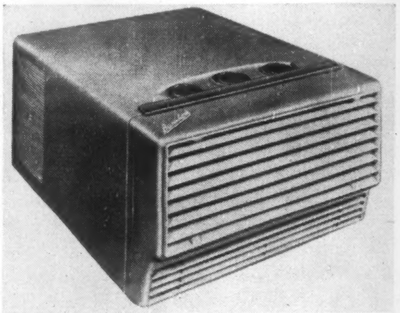
"Aircoustat," a device to quiet fan and air noise in air conditioning systems . . . . It is installed directly into the ductwork by means of flexible connections and can be located either between the fan and room or above individual diffusers. It is constructed of galvanized steel or aluminum and fits ductwork of any design, the company states. Special formed-on flanges can be provided if desired.



Manufacturer—Industrial Sound Control, Inc., 45 Granby St., Hartford, Conn.

Room Air Conditioners

*New line of room air conditioners . . . . Window models include the "Duchess," 1/3 hp unit, the "Princess," ½ hp and the "Queen of Comfort," ¾ hp. The "Westchester," a console model, is available in 1 and 1½ hp sizes. According to the manufacturer, all of these units do a complete conditioning job under automatic thermostatic control. This includes cooling, dehumidifying, ventilating and heating. All window types are built on the tubular plan. The housing is installed first without chassis. Then the chassis slides into place and is ready for operation.



Manufacturer—Burnham Corp., Irvington, N.Y.

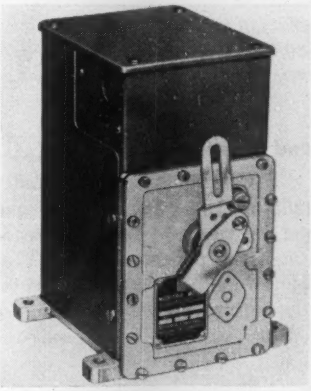
Small Chilling Machine for Laboratories

**Low temperature chilling machine, "Model A-120-1," designed to meet the needs of small heat treating departments and laboratories . . . . The capacity of the chilling chamber is 1 cu ft. Temperature range is from −70 F to −120 F. The addition of an air circulator or a heater can widen the range. The refrigeration system is hermetically sealed, 110 volt, single phase, 60 cycle. The unit may be connected to a standard outlet and requires no special installation procedure.

Manufacturer—Cincinnati Sub-Zero Products Co., 3932 Reading Rd., Cincinnati 29, Ohio.

Electronic Heating-Cooling Controls

Package electronic heating-cooling control for use in commercial buildings . . . . The unit combines an electronic relay and the company's "Modutrol" motor into a single unit to eliminate the need for a separate control panel in many installations. The combination unit is designed for use in a relatively simple heating-cooling installation requiring only one indoor thermostat and a "Weathercaster" thermostat which is mounted either outside the building or in the outdoor air intake. It can also be used in large zoned systems where signals from several electronic thermostats must be coordinated by the relay to actuate the motor valve or damper.



Manufacturer—Minneapolis-Honeywell Regulator Co., 2641 4th Ave., S., Minneapolis 8, Minn.

Fire Resistant Adhesive for Insulation

**A self extinguishing fire-resistant laminating adhesive for adhering glass fiber insulation pads and blankets to sheet metal, aluminum foil, fabric, wallboard and other assembly operations . . . . Called "Insulam," the adhesive is a synthetic rubber-like resin emulsion with quick wet-tack and suction to hold assemblies together until dry. The company states that it then becomes a water resistant adhesive film that will not support combustion. It is said to dry with a translucent film that remains permanently flexible. The bonding strength of assemblies withstands continuous heat of 375 F without delamination, the manufacturer states.

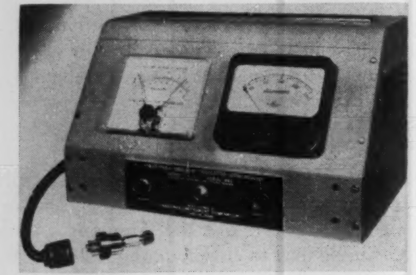
Manufacturer—Paisley Products, Inc., 630 W. 51st St., New York 19.

EQUIPMENT DEVELOPMENTS . . .

[Continued]

Vacuum Indicator-Controller

Vacuum indicator-controller designed to automatically maintain a vacuum system in any pre-set range between 1 and 1000 microns of mercury . . . . The unit provides upper and lower limit control and automatic reset. Applications in industrial processes include controlling vacuum pumps to maintain a vacuum within given limits. The unit may also be used to operate an alarm when the vacuum moves to either the upper or lower limit. The instrument uses gage tubes with noble metal thermocouples and nickelplated housing.



Manufacturer—Hastings Instrument Co., Hampton 11, Va.

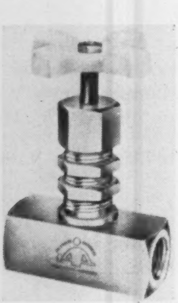
Panel Mounted Needle Valve

"PM Series" panel mounted needle valve for quick installation. . . . The loosened packing nut and first holding nut are removed and the threaded stem guide is slipped through the panel opening. The first packing nut is then replaced and adjusted in relation to the second packing nut, mounting the valve on the panel. The assembly is completed with the addition of the packing nut and valve handle. The valves are designed for a maximum working pressure of 10,000 psi for use on water, oil or gas.

Manufacturer—James P. Marsh Corp., Skokie, Ill.

SEALMASTER
SRC-12

Ball Bearing



Valve

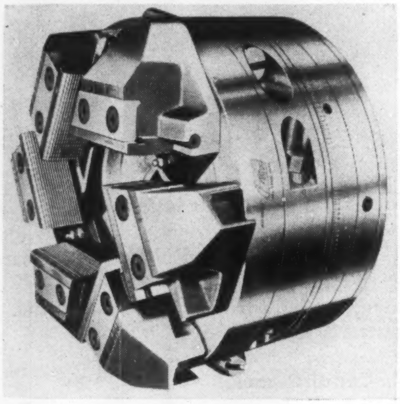
Rubber Mounted Ball Bearing Units

"Sealmaster" rubber mounted ball bearing units designed for reduction of noise and vibration on air conditioning equipment and other light duty applications . . . . Six shaft sizes are manufactured, ranging from ½ to 1 in., and are available as pillow blocks, flange units and cartridge units. The manufacturer states that the synthetic rubber mounting rings are oil and grease resistant and the bearings are lubricated for life at the factory. A patented "zone hardening" process used on the inner race ring of the unit heat treats through the ball path section only. Bearing units are grounded to pressed steel housing to prevent built up of static charge.

Manufacturer—Stephens-Adamson Mfg. Co., Sealmaster Div., 47 Ridgeway Ave., Aurora, Ill.

Head for Large Diameter Pipe Threading

A six-chaser "Lanco" head for precision threading of large diameter workpieces . . . . It is a revolving die head designed for application to the new No. 4 Model C "Landmaco" threading machine and features a 2½ in. to 6 in. pipe capacity and a 2⅞ to 6⅝ in. bolt capacity. According to the manufacturer, the six-chaser design provides greater distribution of cut, greater support for the workpiece, freer cutting action and eliminates out-of-roundness. The 6 in. head can be equipped with an internal trip mechanism, a reamer, and a reamer attachment for the simultaneous threading, reaming and chamfering of pipe and nipples.



Manufacturer—Landis Machine Co., Inc., Fifth and Church Sts., Waynesboro, Pa.

Dual Circuit Packaged Air Conditioner

Addition to the manufacturer's 1954 line is a 15 ton packaged air conditioner featuring two separate 7½ ton refrigeration circuits . . . . According to the company, the dual circuit feature provides economy of operation when the full cooling capacity is not required and permits the equipment to meet the usual local code requirements. The unit is of sectional construction, comprising compressor, blower and plenum, each of which can be ordered separately. For year 'round operation, a heating coil can be mounted in the blower or plenum cabinet.

Manufacturer—United States Air Conditioning Corp., 3300 Como Ave., S.E., Minneapolis 14, Minn.

Console Air Conditioner

*Console type air conditioner known as the "Airditioner" . . . . It is available in three sizes with nominal cooling capacities of 2/3, 1½ and 2 tons. Chilled water is used for cooling and hot water for heating. Each unit is served by three pipes; water supply and return, and drain. Outside air for ventilation is introduced through an aperture in the rear of the unit. Adjustment

TRUST A TESTING LAB TO BUY ON PERFORMANCE

A laboratory that tests ventilating equipment is in a good position to select efficient ventilators for its *own* buildings. Texas Agricultural and Mechanical College is the authorized neutral laboratory certifying fan capacities for the Power Fan Manufacturers Association. Familiar with all types of fan equipment, this college chose DeBothezat Power-Flow Roof Ventilators for its new Veterinary Hospital.

GET ALL THE AIR YOU PAY FOR

Capacity ratings of DeBothezat Power-Flow Roof Ventilators are the output of the completely assembled unit, *including the head*. These ratings are obtained from wind tunnel tests conducted in accordance with NAFM Standard Test Code Bulletin number 110, Plate VIA. They conform to U. S. Department of Commerce Standard 178-51, which embodies the test codes of ASHVE, NAFM and PFMA.

Certified Ratings
PFMA

Next time you buy or specify roof ventilators, consider their cost in terms of CFM. And for your own protection, ask the manufacturer how he arrives at ventilator capacity ratings.

DeBothezat Power-Flow Roof Ventilators atop the Veterinary Hospital at Texas A&M College. Hospital built under the direction of Arch C. Baker, Texas A&M College System Architect, and J. W. Hall, Consulting Engineer.

SEND FOR **FREE CATALOG**

DeBothezat Fans

DIVISION OF
AMERICAN MACHINE AND METALS, INC.
EAST MOLINE, ILLINOIS

DeBothezat Fans Division
American Machine and Metals, Inc.
Dept. HP-454, East Moline, Illinois

Send Catalog DR-3-53 containing certified ratings and complete data on Power-Flow Roof Ventilators.

FIRM NAME ______

ADDRESS ______

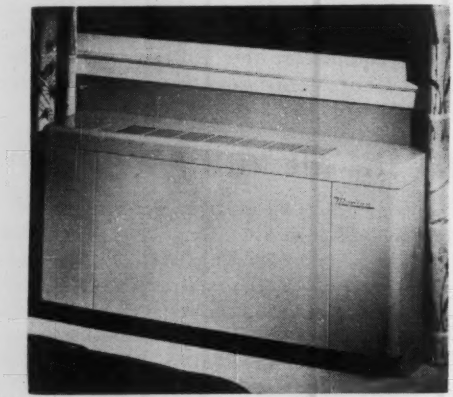
CITY ______ ZONE ______ STATE ______

NAME AND TITLE ______

EQUIPMENT DEVELOPMENTS . . .

[Continued]

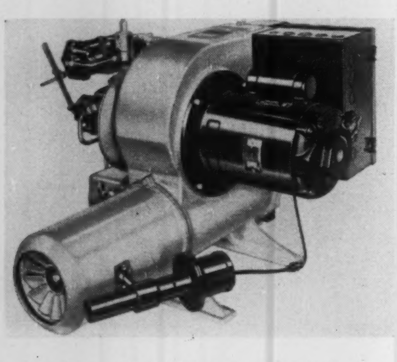
of a manually operated damper controls the mixture of outside and recirculated air. The units may be recessed up to 5 in., with less than 6 in. protruding into the room. All units are provided with air filters, adjustable air mixing dampers, three-speed motor control, high capacity reversible coil, twin access doors and manually removable enclosure fronts.



Manufacturer—Modine Mfg. Co., 1509 De Koven Ave., Racine, Wis.

Oil Burner

"Hev-E-Oil Burner" with 35 percent increase in capacity over previous models . . . . It is designed for fuel users where a burner is used to heat a building containing over 1500 sq ft of radiation, or if more than 6000 gal of oil, or more than 45 tons of coal a year is burned. An all electric ignition oil burner, it is a low pressure, air atomizing type and is designed to burn No. 4 or 5 oil without preheating. The burner is a packaged unit, completely wired, ready to set into a boiler or heating plant. Features include an oil metering pump to measure the correct amount of oil for any given operating condition, and a control box mounted on the burner. According to the company all primary and secondary air is furnished by the burner. Carbon accumulation and clogging of burner nozzles is said to be eliminated by a self cleaning feature.



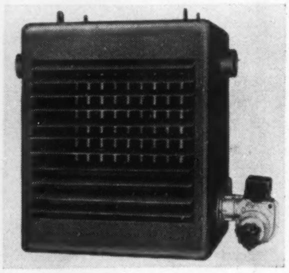
The burner may be adjusted so that fuel oil from No. 1 through No. 5 may be used.

Manufacturer—Cleaver-Brooks Co., 326 E. Keefe Ave., Milwaukee 12, Wis.

Oil Fired Unit Heater

**Unit heater fired with a conventional gun-type oil burner . . . . Known as Model "UH-220," its vertical flue travel is designed to permit the products of combustion to be exhausted into the atmosphere through a short flue pipe without the use of a high draft permanent chimney. The burner and flue outlet can be attached to either side of the unit heater. Hanging hooks are provided for suspending the unit from the ceiling and four ½ in. bolts are furnished on the bottom of the casing to permit attachment. The louvers are adjustable to vary the direction of the heated air. The heat output is 220,000 Btu per hr when fired with a 2 gph nozzle. The manufacturer states that the ½ hp propeller fan and motor will throw heated air 50 to 75 ft. Air delivery is rated at 5730 cfm.

Manufacturer—Certified Furnace Corp., Trenton, N.J.



Above: Heater

Left: Trap

Steam Trap

"Heat-Kwik Super-Silvertop" steam trap. . . . The manufacturer states that fast air venting is accomplished through the use of two separate orifices, one for condensate and a separate bellows orifice for air. When the trap is cold, the bellows orifice is wide open to handle large quantities of air rapidly. After all of the air is removed through it, the bellows expands and closes the orifice. Thereafter air is removed through the vent hole in the bucket. Due to the construction of the head of the trap, it may be opened for inspection or servicing without removal from the pipe line. These steam traps have the inverted bucket guided on a patented hexagonal tube. According to the firm, this prevents the bucket from being damaged on the side of the case, and also keeps the valve and seat in line.

Manufacturer—The V. D. Anderson Co., 1935 W. 96th St., Cleveland 2, Ohio.

Low Temperature Dryer

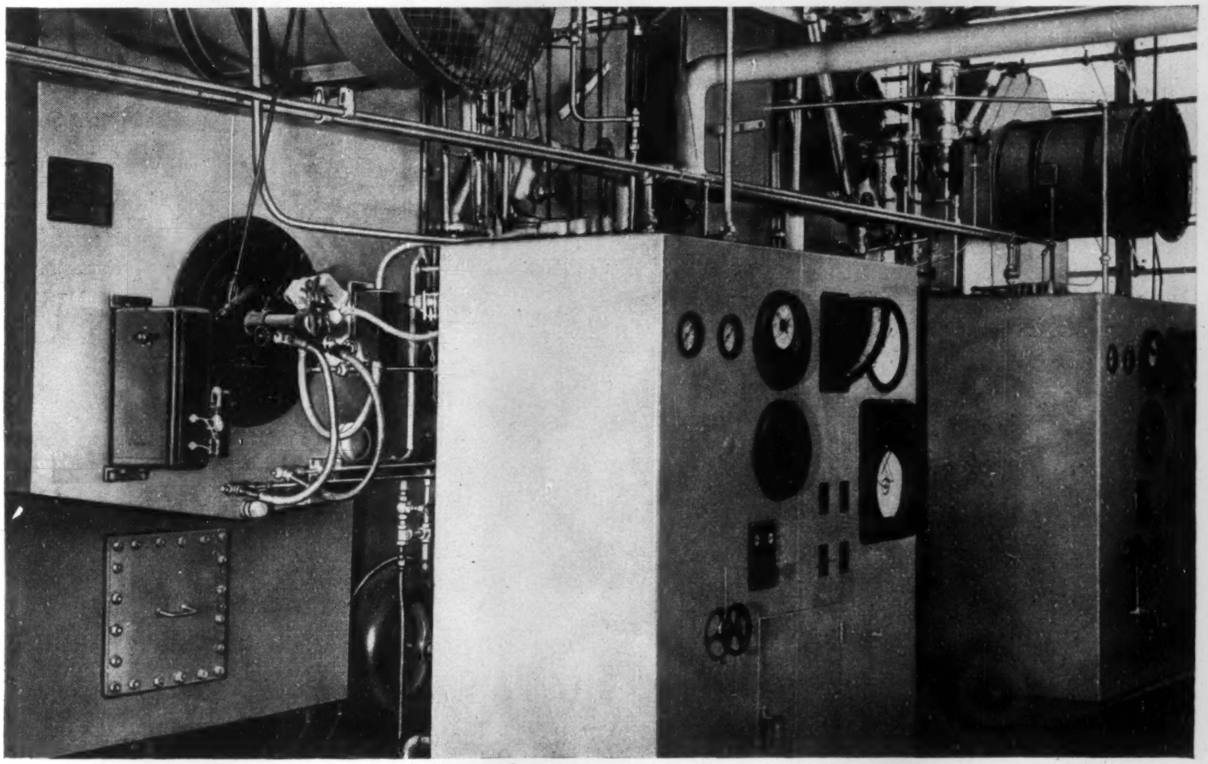
*High speed low temperature dryer. . . . The manufacturer states that the dryer is applicable to the processing of materials such as gelatin, glue, soap, pharmaceuticals, and other products which are temperature sensitive. The low relative humidity is obtained by dehumidification rather than by raising of the air temperature. The dryer consists of "Kathabar" dehumidification equipment, an air distribution system and conveying equipment. A heat exchanger system delivers the material,

[Continued on page 208]

keeping steam cheap . . .

℞ for HOSPITALS

with the B&W Type FM Boiler



These two Type FM, B&W Integral-Furnace Boilers supply steam for all heating, cooking, and laundry requirements at a large midwestern hospital.

COST-SAVING FEATURES

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

Among the many enthusiastic users of the shop-assembled B&W Integral-Furnace Boiler, Type FM, hospitals have found it uniquely suitable to meet their varied steam requirements. Typical of the FM Boilers now serving hospitals in various parts of the country is this dual-unit installation, which is supplying low-cost steam for all heating, laundry, and cooking requirements at a midwestern institution.

Easy to install, this compact B&W steam generator is delivered complete with firing equipment and controls . . . is ready to skid or lift into position, hook-up, and place in operation. Push-button starting and stopping and automatic handling of load variations simplify operation . . . make the Type FM Boiler ideal for small to medium-sized installations where operators have additional duties. Even for some larger installations it has been found practical and more economical to have a multiple-unit, Type FM installation rather than one or more large boilers requiring complete field erection and close operating supervision.

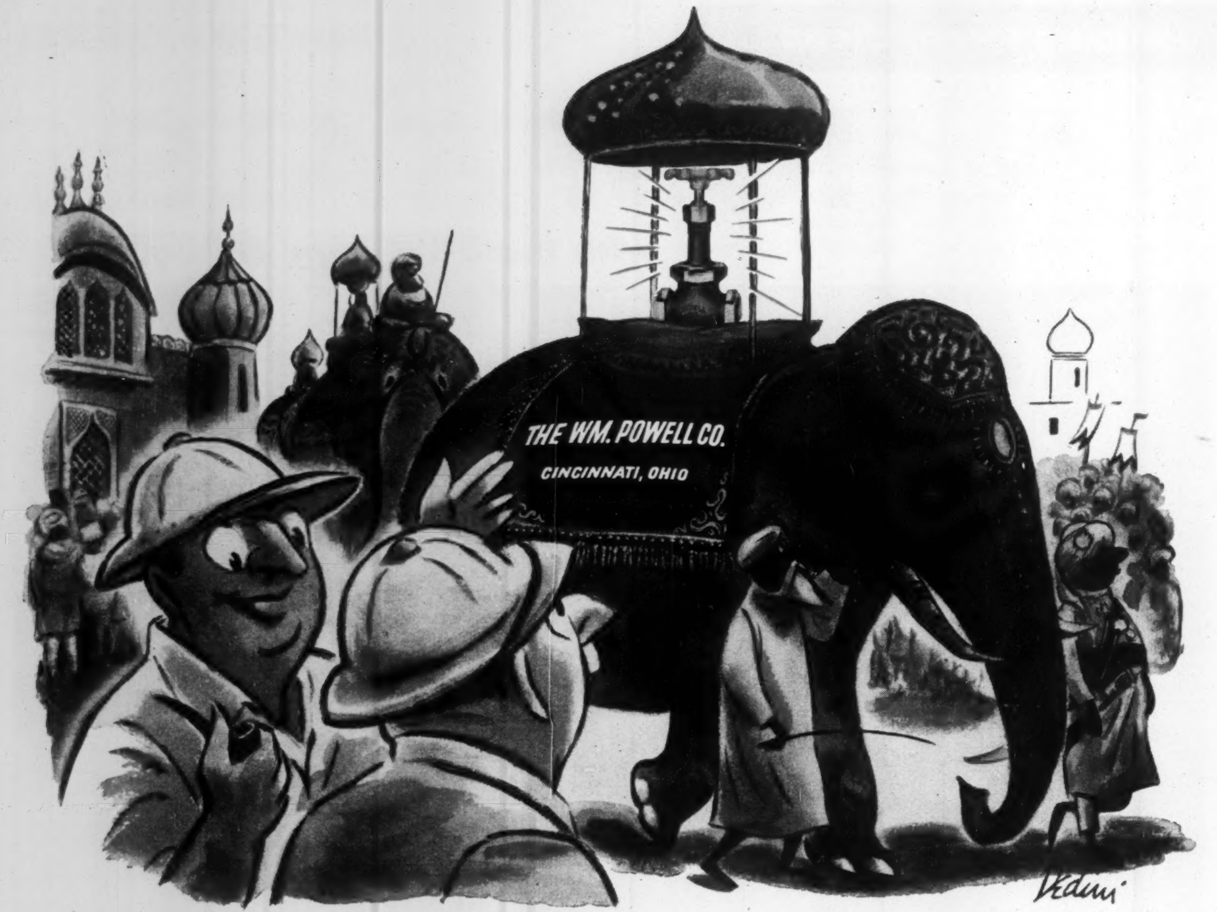
Available in standard sizes for loads ranging between 2900 and 28,000 lb of steam per hr at pressures to 235 psi, this efficient B&W unit is already enjoying wide popularity with users in a broad range of industrial, commercial, institutional, and other classifications . . . is in service or on order for a total steam capacity approaching 7,000,000 lb per hr.

For a detailed illustrated description of how you can benefit from the cost-saving features of the B&W Type FM Boiler, write for Bulletin G-76A. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd St., New York 17, N. Y.

BABCOCK & WILCOX

BOILER DIVISION

G-611

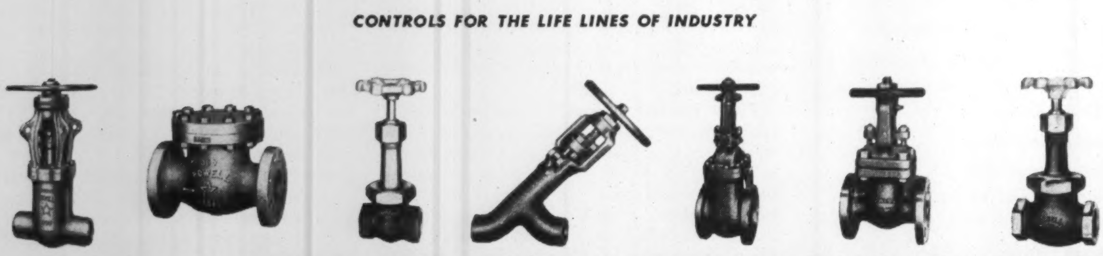


"You see POWELL VALVES everywhere!"

Not surprising when you realize that Powell makes more kinds of valves and has probably solved more valve problems than any other organization in the world. And this has been going on since 1846.

Wherever flow requires dependable control, there's the place for Powell Valves—available through distributors in principal cities. Made $\frac{1}{8}''$ to 30″ and 125 pounds to 2500 pounds W. S. P. Bronze, iron, steel and corrosion resistant alloys. On problems, write direct to The Wm. Powell Company, Cincinnati 22, Ohio.

CONTROLS FOR THE LIFE LINES OF INDUSTRY



Powell Valves *108th year*

Below: The Gateway Center — imposing and beautiful indication of Pittsburgh's extensive "face lifting." The air conditioning system in these buildings sets new records for size and advanced features. Mechanical contractor: Kirby Saunders, Inc. Consulting Engineers: Meyer Strong & Jones. Architects: Irwin Clavan, and Eggers and Higgins. Builders: Starret Bros. & Eken, Inc. Owners and Operators are the Equitable Life Assurance Society of the United States.

"Largest commercial
air conditioning
system" uses...

ELLIOTT CROCKER-WHEELER MOTORS

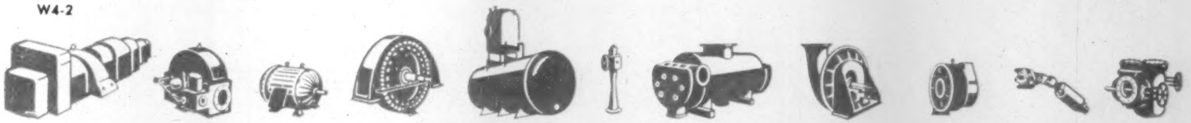
PITTSBURGH'S NEW GATEWAY CENTER includes three fine modern office buildings of 20 and 24 stories, in which are 6013 individual room-cooling units, making what is reputed to be the largest commercial system of air conditioning in the world. Air, driven by 24 fans, high and low pressure, circulates at the rate of 750,000 cfm. Water piping required totals 72 miles, carrying water at 7500 gpm.

In this large installation many Elliott Crocker-Wheeler motors drive intake fans, exhaust fans, cooling water pumps and refrigeration pumps. For the details which indicate why these motors were selected for this outstanding job, contact your local Elliott representative or write Elliott Company, Crocker-Wheeler Division, Ampere, N. J.

Above: Close-up of one of the numerous Elliott C-W motors that handle important drives in the huge air conditioning system. This is one of three 200-hp, 1170-rpm drip-proof induction motors that drive the 4600-gpm, 125 ft. head condenser-water pumps. Other Elliott motors from 7½ hp up are driving the many pumps and fans at the Gateway Center.

ELLIOTT Company

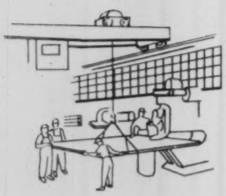
W4-2

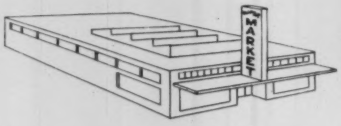

TURBINE-GENERATORS
TURBINES
MOTORS
GENERATORS
DEAERATING HEATERS
EJECTORS
CONDENSERS
COMPRESSORS
TURBOCHARGERS
TUBE CLEANERS
STRAINERS

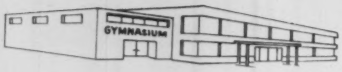
Put Heat Where You Need It . . .

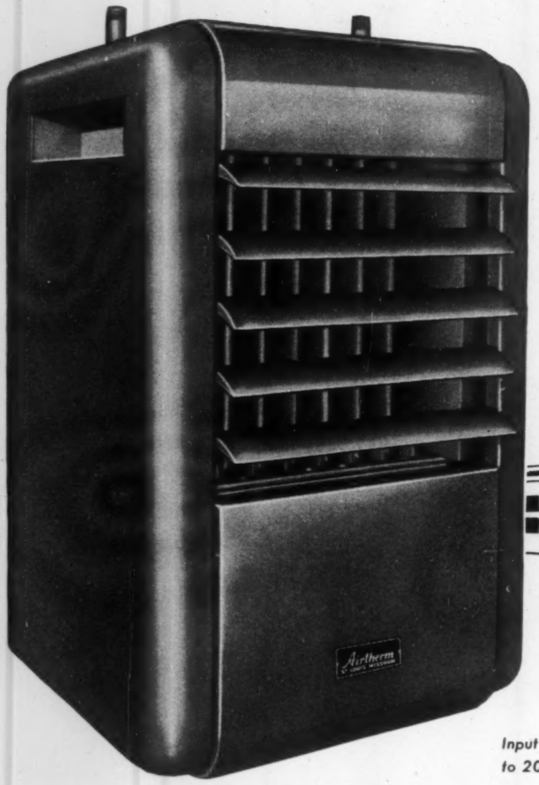
Easily and Economically

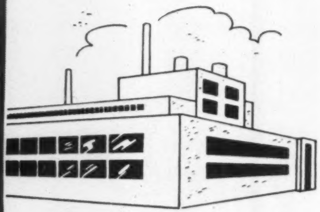
with *Airtherm* GAS UNIT HEATERS











Input 25,000 BTU to 200,000 BTU

These attractive, self-contained units now give you new freedom and flexibility in laying out heating systems. For quiet, clean and completely automatic heat, they can be installed just about anywhere you can run a gas pipe.

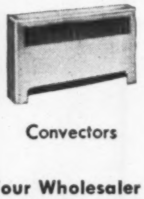
In addition to general heating in commercial, industrial and institutional buildings of all kinds, you'll find Airtherm Gas Unit Heaters useful for many special purposes, such as drying, blanketing doorways, etc.

For complete data on gas unit heater installation with all types of gases, write for your FREE copy of Catalog 500.

For Heating Satisfaction . . .
Think First of
Airtherm

Oil or Gas Direct Fired Heaters

Horizontal Type Unit Heaters

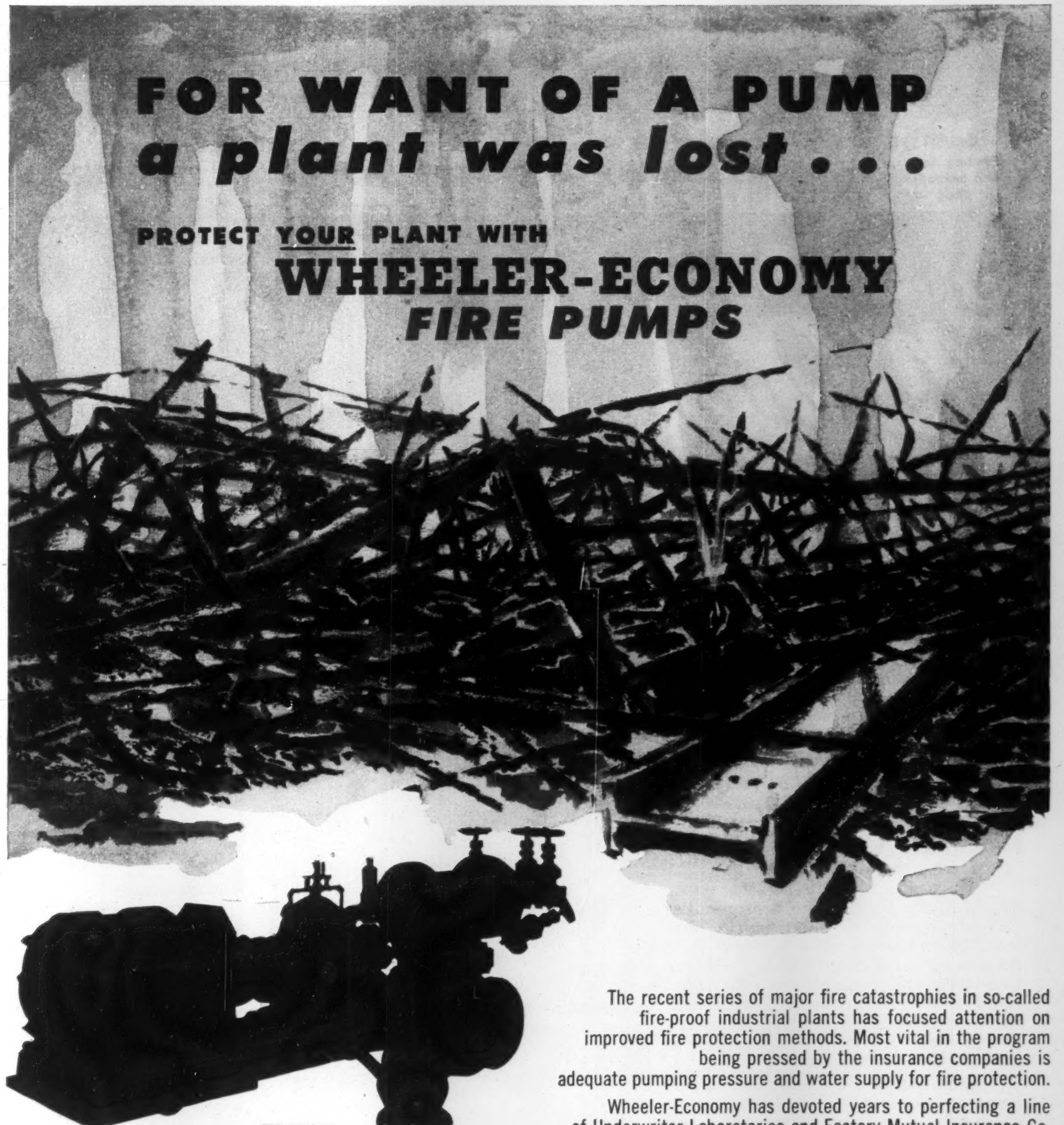

Convectors

Vertical Type Unit Heaters

Centrifugal Fan Unit Heaters

Ask Your Wholesaler or Write

AIRTHERM MANUFACTURING COMPANY
711 South Spring Avenue • St. Louis 10, Missouri



FOR WANT OF A PUMP *a plant was lost . . .*

PROTECT YOUR PLANT WITH

WHEELER-ECONOMY *FIRE PUMPS*

The recent series of major fire catastrophies in so-called fire-proof industrial plants has focused attention on improved fire protection methods. Most vital in the program being pressed by the insurance companies is adequate pumping pressure and water supply for fire protection.

Wheeler-Economy has devoted years to perfecting a line of Underwriter Laboratories and Factory Mutual Insurance Co. approved fire pumps.

Look into this line today . . . A Wheeler-Economy Fire Pump may save you untold losses in equipment, production and employment by being on the job with "pressure-plus" when fire breaks out.

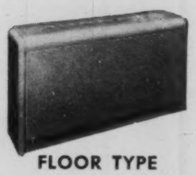
Write for Bulletin and name of nearest Wheeler-Economy representative.

APPROVED UL FM

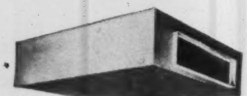
WE-402

WHEELER-ECONOMY PUMPS

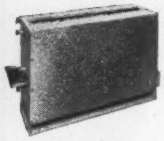
ECONOMY PUMPS, INC. · DIVISION OF C. H. WHEELER MANUFACTURING CO.
19TH AND LEHIGH, PHILADELPHIA 32, PA.



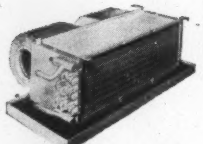
FLOOR TYPE
For free standing mounting beneath windows or along walls.



CEILING TYPE
For suspended mountings.



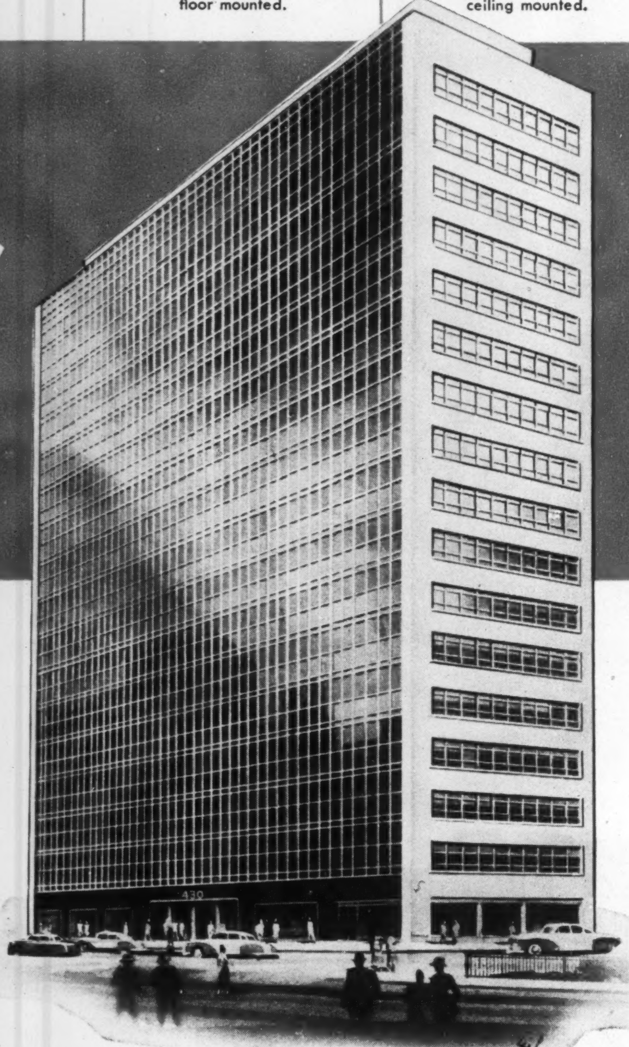
BASIC TYPE
For fully recessed installations, floor mounted.



HIDEAWAY TYPE
For fully recessed installations, ceiling mounted.

644 McQuay SEASONMAKER

Individual room air conditioners



insure tenant satisfaction at 430 Park Avenue, New York City

644 McQuay Basic Type Seasonmaker individual room air conditioners were installed in the beautiful new 430 Park Avenue office building in New York City to satisfy the demand for individual room comfort and control. The Seasonmaker's quiet operation and attractive design make it a welcome addition to any multi-room building.

The Seasonmaker's year 'round performance actually "makes the seasons come to you" . . . providing heated, and filtered air in winter; cooled, dehumidified, and filtered air in summer.

All Seasonmaker Air Conditioning Units have the famous McQuay Ripple-Fin coil construction assuring long life and dependable service. Available in Floor Type, Ceiling Type, Basic and Hideaway Types as illustrated above. For use with central systems circulating chilled or hot water or Freon. Easy to install and maintain in old buildings as well as new. Write for Condensed Bulletin 703. Representatives in principal cities.

ARCHITECTS:
Emery Roth & Sons, New York
BUILDERS:
Freeman & Gerla, New York
AIR CONDITIONING CONTRACTOR:
Mance Corporation, New York
MECHANICAL ENGINEER:
Mr. John Anselmo of Sears & Kopf, New York

MAKE THE SEASONS COME TO YOU

McQuay INC.

1601 Broadway St. N.E., Minneapolis, Minnesota

AIR CONDITIONING • REFRIGERATION • HEATING

INSTALL *Custom Designed* CONVECTOR GRILLES

without increasing your building costs

- **EXTRA RUGGED**
  Made to *withstand heaviest use and abuse* which lower wall grilles must take.
- **TAMPER PROOF**
  No "see-thru". Extra-close spacing of louvers prevents gum wrappers—waste paper from being dropped between louvers.
- **EXTRA-HEAVY SUPPORT BARS**
  Heavy-duty steel bars on 6″ centers give added strength where it is most needed.
- **MADE TO ANY SIZE**
- **OVER 70% FREE AREA**
- **EASILY INSTALLED**
  Precision built to fit snugly. Can be installed in marble, tile or other special surfaces.
- **EXTRA-WIDE BLADES FOR MOST EFFICIENT DEFLECTION OF AIR**
- **EACH DEFLECTING BLADE "HEMMED" FOR ADDED STRENGTH —ADDED SAFETY**
- **ALSO AVAILABLE WITH DAMPER AND KNOB CONTROL**

Above
Photo shows AIRFOIL convector grilles installed in John Hancock Building

Architects—
Crame & Ferguson,
Boston, Mass.

Gen. Contractors—
Turner Const Co.,
Boston, Mass.

Heating & Ventilating Engineers—
Buerkel & Co., Inc.,
Boston, Mass.

Sheet Metal Contractors—
Stanley E. Priggen Co.,
Boston, Mass.

AirFoil

AIR CONDITIONING OUTLETS

AIRFOIL CUSTOMED CONVECTOR GRILLES are *built above and beyond average demand. Give air distribution performance that's above and beyond average—YET COST IS KEPT AT STANDARD PRICES.*

Superior construction and performance usually reserved for the highest-priced grilles are incorporated as standardized features of this great new line of convector grilles. *They meet the most exacting specifications of architects and engineers.*

AIRFOIL CONVECTOR GRILLES are better designed—more durable. Feature for feature, dollar for dollar—they cannot be duplicated. Made with a "decorator's touch," *they add new beauty to any installation.*

Free

CHECK TYPE OF GRILLE ON WHICH INFORMATION IS DESIRED

☐ Air conditioning outlets
☐ Return air grilles and registers
☐ Volume controllers
☐ Perforated metal and ornamental grilles
☐ Door ventilators
☐ Special made-to-order grilles

TITUS MANUFACTURING CORP., WATERLOO, IOWA

☐ RUSH information on Convector Grilles.
☐ Send complete catalog.
☐ Send literature on above checked items.

NAME____________________
ADDRESS____________________
CITY____________________STATE__________

For Step No. 3 in perfecting air conditioners . . .

L·O·F FIBER·GLASS for Noise Control

1. Cooling

2. Dehumidifying

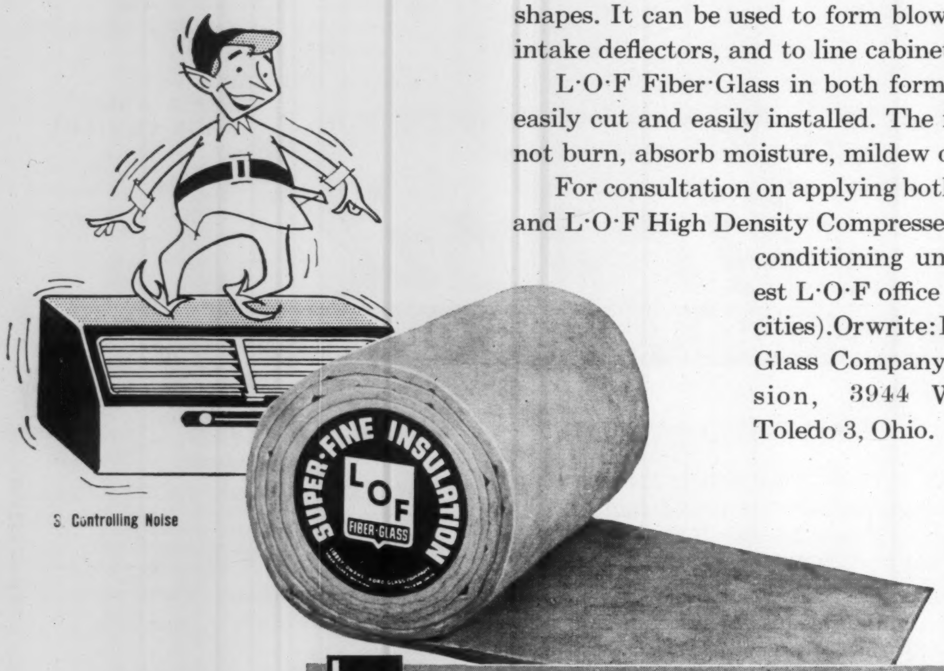
In Step No. 3—the control of noise—air-conditioning engineers tell us that two kinds of L·O·F Fiber·Glass are indicated;—

One is the same basic material now used as thermal insulation for air-conditioning ducts—flexible, blanket-type L·O·F Super·Fine Fiber·Glass. This provides high-efficiency *sound* insulation; absorbs airborne sounds in the middle- and high-frequency ranges. Vinyl-faced Super·Fine is specified for highest sound-absorbing efficiency.

To reduce noises created by vibration, L·O·F now makes available High Density Compressed Fiber·Glass. This is a new form of compressed, high density Fiber·Glass which can be molded, if desired, into shapes. It can be used to form blower housings and air intake deflectors, and to line cabinets.

L·O·F Fiber·Glass in both forms is easily handled, easily cut and easily installed. The fine glass fibers will not burn, absorb moisture, mildew or rot.

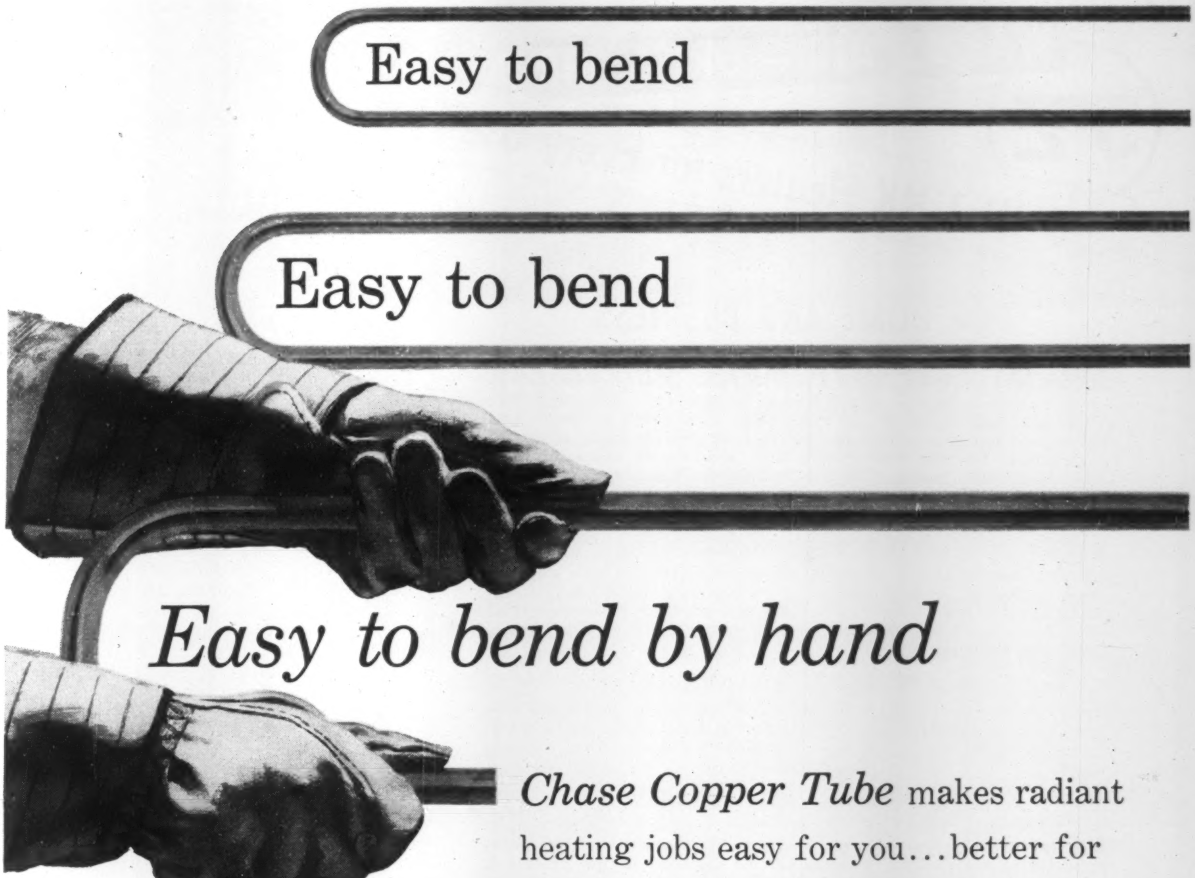
For consultation on applying both L·O·F Super·Fine and L·O·F High Density Compressed Fiber·Glass to air conditioning units, call your nearest L·O·F office (offices in 26 major cities). Or write: Libbey·Owens·Ford Glass Company, Fiber·Glass Division, 3944 Wayne Building, Toledo 3, Ohio.



3. Controlling Noise

FIBER · GLASS

LIBBEY·OWENS·FORD GLASS COMPANY
FIBER·GLASS DIVISION



Easy to bend by hand

Chase Copper Tube makes radiant heating jobs easy for you...better for your customers. It's *soft* temper for easy bending...*light* for easy handling...and it comes in long lengths—so fewer joints are needed. Combined with Chase Solder-Joint Fittings, it makes a leak-proof, pressure-tight, *quality* system that's corrosion-resistant and can't clog with rust—*ever.* Order from your Chase wholesaler.

Chase®

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass & Copper

Albany†
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Los Angeles
Milwaukee
Minneapolis
Newark
New Orleans
New York
Philadelphia
Pittsburgh
Providence
Rochester†
St. Louis
San Francisco
Seattle
Waterbury
(†sales office only)

WARMS AIR — DRIES AIR

J-Z JOHN ZINK

JOHN ZINK Heaters for Every Use

FOR HOME AND BUSINESS
SPECIFY SAFE, AUTOMATIC J-Z HEATERS

There are four styles of J-Z Heaters to meet every domestic and industrial heating requirement. J-Z Heaters provide many advanced engineering features that assure safe, economical operation and maximum heat output. Whether bought for home or commercial use, J-Z Heaters and Burners are AGA approved for natural, mixed or LP Gas.

FLOOR FURNACES

J-Z Gas Fired FLOOR FURNACES are available in five conventional and short models with input ratings from 30,000 B.T.U./hr. They become a complete one-package heating unit when equipped with safety pilot and automatic temperature control. Small grille, high heat transfer.

SUSPENDED UNIT HEATERS

Series UHS Fan Type UNIT HEATERS are fully automatic and provide clean, safe and trouble free forced air heating. Heaters are for all gases and are equipped with positive automatic safety shut-off valves. Have B.T.U./hr. rating from 55,000.

CENTRAL GAS HEATERS

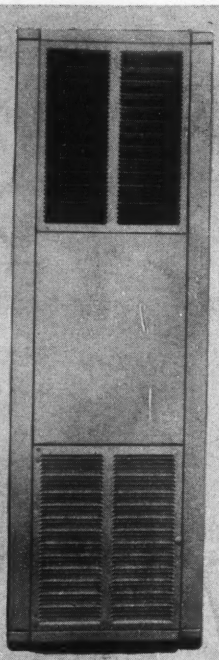
J-Z CENTRAL HEATING UNITS are compactly built, simple, efficient in operation and are available in Vertical or Horizontal type forced air models. Heaters can be installed in the basement, attic, service closet or utility room. The AF-110 may even be installed under the house if provisions are made for the draft diverter. For industrial applications, J-Z Central Heating Units can be installed on a shelf or balcony, as a suspended heater or as a duct heater. B.T.U./hr. ratings from 65,000.

WALL HEATERS

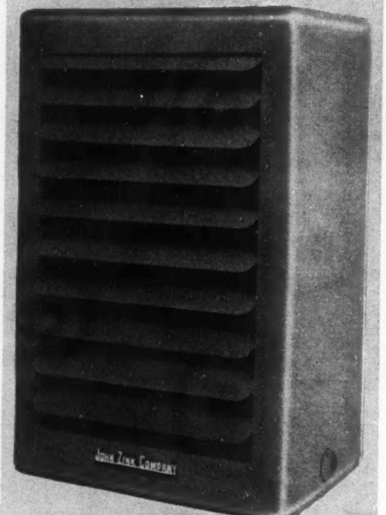
WH-25 Recessed Wall Heater fits between partitions on 16" stud centers. Barely 58" high. Available in standard or radiant styles. 25,000 B.T.U./hr. rating.

JOHN ZINK COMPANY

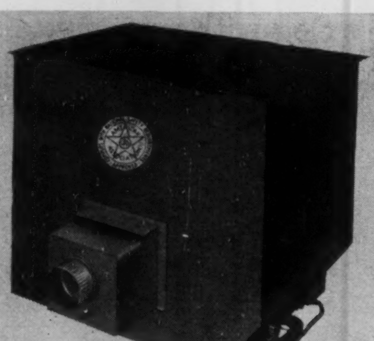
4401 SOUTH PEORIA • TULSA, OKLAHOMA



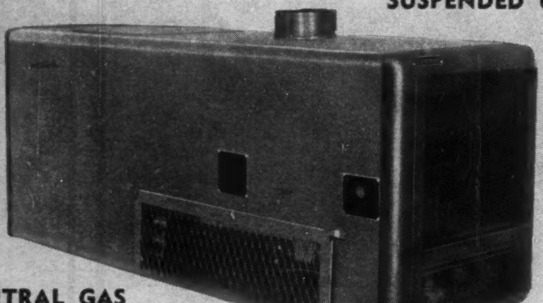
WALL HEATER



SUSPENDED UNIT HEATER



FLOOR FURNACE



CENTRAL GAS HEATER

THERE'S AN

EXTRA DIVIDEND IN

STEEL PIPE!

There are plenty of good reasons why you get top-quality pipe when you buy SPANG CW. But the very careful steps used to test and inspect SPANG CW Pipe prior to shipping give you an "extra dividend" that pays off in top-quality installations. Here's what we mean:

TESTING. Each length of SPANG Pipe is subjected to a hydrostatic test, the final check to make sure the weld is sound. Test pressures applied are well above actual requirements.

INSPECTION. Threads and couplings are gauged and measured for length, pitch and quality. Each length of pipe is inspected visually inside and out with the aid of light from fluorescent tubes to be positive that it meets SPANG's high product requirements.

To these two factors add quality steel, automatically-controlled furnaces, and the latest developments in mechanized production. Result: consistently good quality pipe for every type plumbing, heating, air conditioning, radiant heating and snow melting installation.

Why buy just any pipe when you can get top-quality SPANG Pipe at no extra cost? Specify SPANG CW Steel Pipe for your next installation.

SPANG-CHALFANT

DIVISION OF THE NATIONAL SUPPLY COMPANY

General Sales Office: Two Gateway Center,
Pittsburgh, Pennsylvania. District Sales Offices:
Atlanta, Boston, Detroit, Houston, Los Angeles,
New York, Philadelphia, Pittsburgh, St. Louis.

Guaranteed TO SHUT TIGHT*

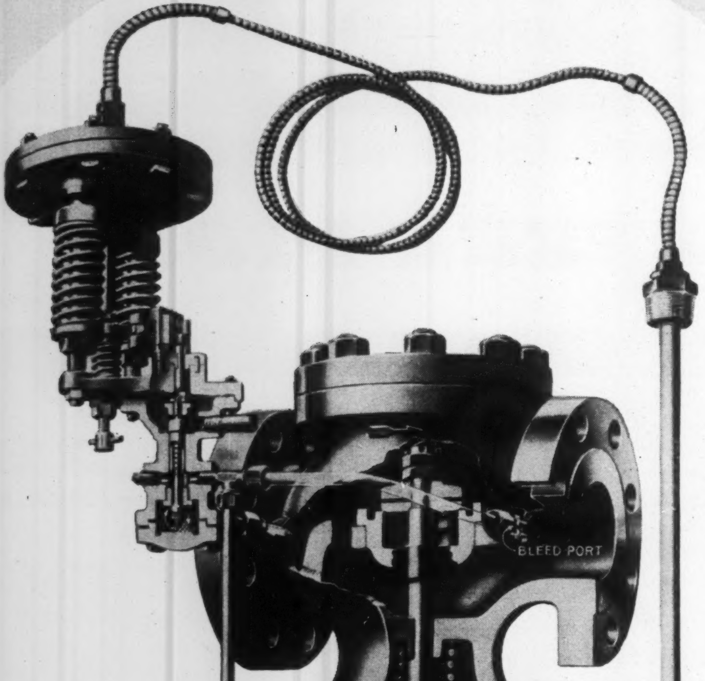
* When equipped with a SECO Metal Seat and Disc on steam service and protected by an approved Strainer, a Spence Regulator is guaranteed to shut tight when the demand for steam ceases.

Expensive steam leaks due to a lack of absolutely tight shutoff are eliminated in Spence Temperature Regulators. Here is why we can make such a guarantee:

First, our temperature regulators are of the single seat design. Seats and discs are made of durable SECO Metal. More than 20 years experience in thousands of installations has failed to produce a single case where SECO Metal has been cut by steam.

These plus other design features explain why Spence Temperature Regulators function dependably and accurately year after year without requiring expensive repairs or special attention.

Want more facts? Write for Bulletin T50 giving full details.



SPENCE
TYPE ET150
Temperature
Regulator

Spence

**SPENCE ENGINEERING
COMPANY, INC.**
WALDEN, NEW YORK

SE 129

DURABILITY
APPEARANCE
FABRICATING COSTS
CORROSION
HEAT TRANSFER
ELECTRICAL CONDUCTIVITY
WORKABILITY

IN EVERY CASE

HUSSEY COPPER

IS INDICATED FOR YOUR PRODUCT

Select the production or service characteristic your product requires and you'll find HUSSEY COPPER exactly fills the bill.

If production is a problem, rely upon the extreme ease of cutting, forming, stamping or spinning Hussey Copper and your choice of lock seaming, soldering or brazing for assembly. Consider, too, the smooth surface and bright finish on Hussey Copper that can save you many finishing operations. All these "work-savers" mean faster production, fewer and less complicated fabrication operations and minimum finishing.

For dependable service in your product, Hussey Copper offers lifetime durability, freedom from corrosion failure, excellent heat transfer or electrical conductivity. Hussey Copper is an original equipment specification that assures low cost production and unsurpassed product quality.

HUSSEY

C. G. HUSSEY & COMPANY
(Division of Copper Range Co.)
ROLLING MILLS AND GENERAL OFFICES
PITTSBURGH 19, PA.

7 Convenient Warehouses to serve you:

PITTSBURGH (19)
2850 Second Avenue

CLEVELAND (14)
5318 St. Clair Avenue

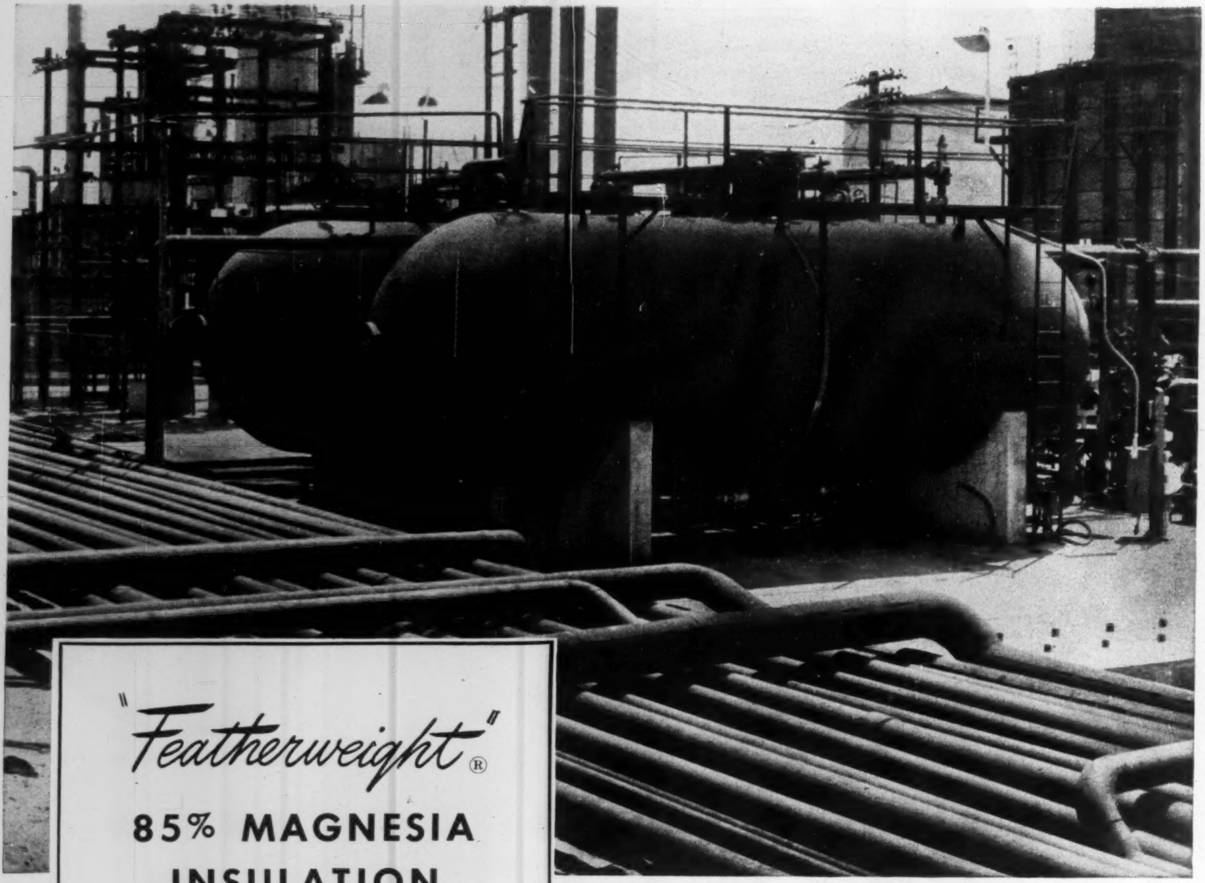
NEW YORK (13)
140 Sixth Avenue

CHICAGO (18)
3900 N. Elston Avenue

ST. LOUIS (3)
1620 Delmar Boulevard

PHILADELPHIA (30)
1632 Fairmount Avenue

CINCINNATI (2)
424 Commercial Square



"*Featherweight*"®

85% MAGNESIA INSULATION

Desalters and piping in West Texas Refinery, insulated with "Featherweight" 85% Magnesia and covered with weatherproofing materials. Insulation contractor: Willard A. Selle Co., Inc., El Paso, Tex.

helps refinery conserve dollars

"Save heat—save money" is an operating rule that holds true for almost every industry. In the refinery illustrated here, heat is effectively conserved by the use of "Featherweight" 85% Magnesia, used to insulate various pieces of hot piping and equipment.

For any industrial insulation use, "Featherweight" proves to be a thrifty choice. By itself this material (85% basic carbonate of magnesia and asbestos fiber) has an effective insulating range up to 600°F. Used with K&M Hy-Temp Insulation, its range is extended to 1900°F.

Hy-Temp is applied directly to the hot surface, and "Featherweight" is used as the second layer. The two materials, when applied with staggered vertical and horizontal joints, eliminate heat loss which occurs on single layer installations when the expansion of hot piping and equipment causes joints to open.

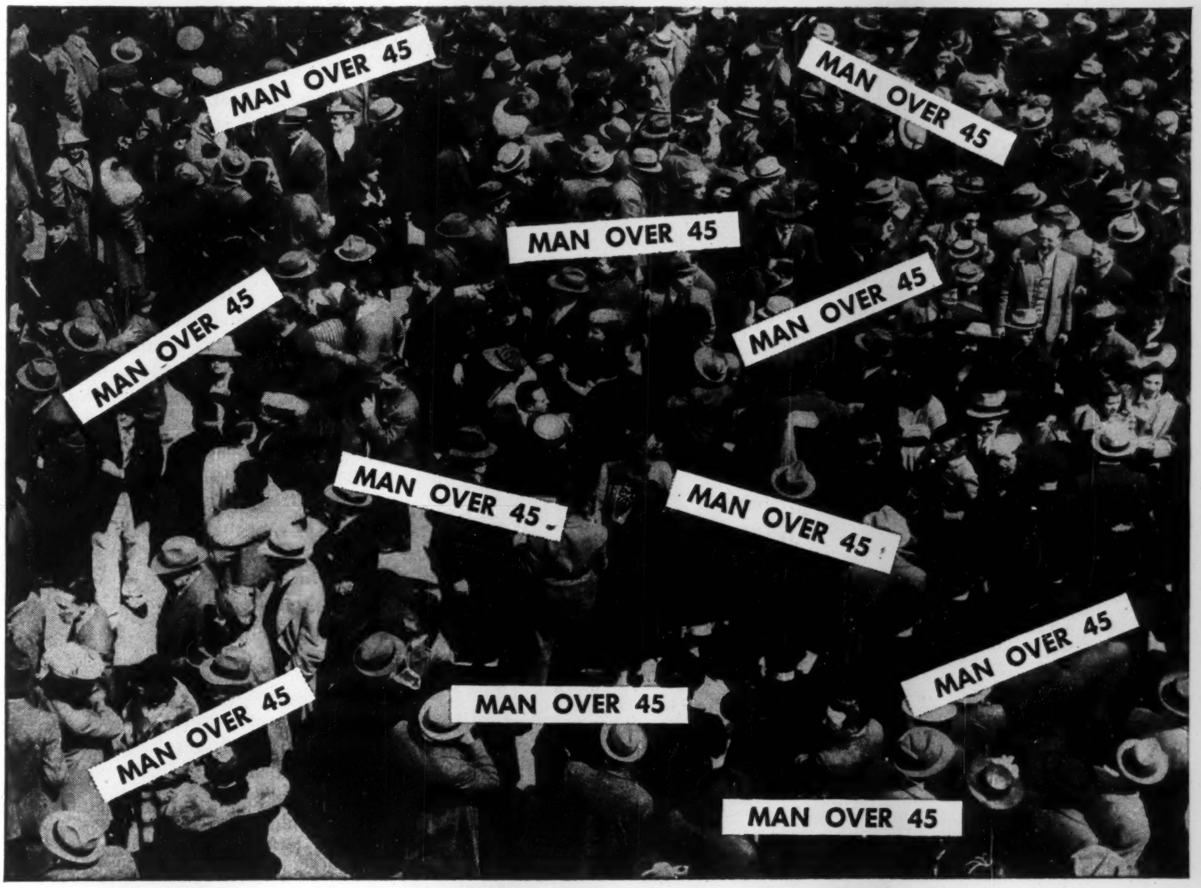
These K&M insulations will last the life of the equipment they serve, will withstand moisture, vibration, and frequent temperature change. With a waterproof jacket, they serve equally well outdoors. Both materials are supplied in various sizes and thicknesses.

Your K&M distributor is an experienced applicator who will gladly give you more information about these heat-saving, money-saving K&M insulations. Or write directly to us.

KEASBEY & MATTISON COMPANY • AMBLER • PENNSYLVANIA

Nature made asbestos . . . Keasbey & Mattison has made it serve mankind since 1873

K&M best in asbestos ®


MAN OVER 45
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MAN OVER 45

But why MEN over 45?

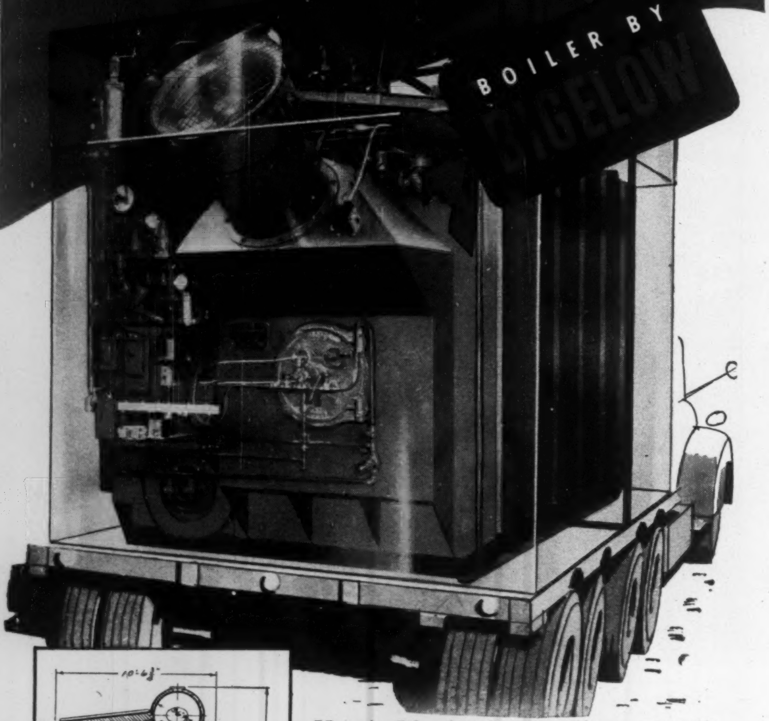
Our doctors still don't know *why*, but if you are a man over 45 you are six times as likely to develop lung cancer as a man of your age twenty years ago. They *do* know, however, that their chances of saving your life could be about *ten times* greater if they could only detect cancer long before you notice any symptom in yourself. (Only 1 in every 20 lung cancers is being cured today, largely because most cases progress too far before detected.) That's why we urge that you make a habit of having your chest X-rayed every six months, no matter how well you may *feel*. The alarming increase of lung cancer in men over 45 more than justifies such precautions. Far too many men die needlessly!

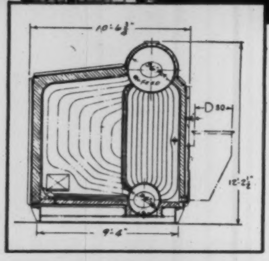
Our new film "The Warning Shadow" will tell you what every man should know about lung cancer. To see this film and to get life-saving facts about other forms of cancer, phone the American Cancer Society office nearest you or simply write to "Cancer"—in care of your local Post Office.

American Cancer Society

New **Shop-Assembled Power Package**

Type H, Water-Tube



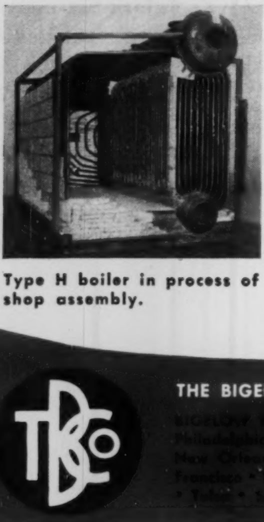


Here's Bigelow's new, "one-piece" answer to a wide range of steam problems. This water-tube "packaged" boiler includes burner, forced-draft fan, feed water regulator, soot blower, valves, refractory, insulation, controls and accessory equipment. It is shipped complete—ready to operate as soon as service connections are made.

Advantages

Cuts Installation Costs and Time . . . Requires Small Space . . . Portable . . . Simple To Operate . . . Fast Steaming With Safety, Efficiency and Economy . . . Low Maintenance . . . Handles Quick Load Changes Easily and Efficiently . . . Wide Range Of Service . . . Burns Oil or Gas.

Available in standard sizes for capacities ranging from 8,000 to 30,000 lbs. of steam per hr. Write for complete catalog.



Type H boiler in process of shop assembly.

THE BIGELOW COMPANY • NEW HAVEN 3, CONN.

BIGELOW REPRESENTATIVES: Boston • New York • Chicago • Philadelphia • Syracuse • Detroit • Atlanta • Milwaukee • New Orleans • Petersburg, Va. • Washington, D.C. • San Francisco • Los Angeles • Seattle • Indianapolis • Kansas City, Mo. • Tulsa • Salisbury, Md.

BI-13

EQUIPMENT DEVELOPMENTS

[*Continued from page* 192]

in a form suitable for fast drying, to the belt. Standard sizes range from 100 lb an hr to 2000 lb an hr.

Manufacturer — Surface Combustion Corp., 2375 Dorr St., Toledo 1.

Bronze Alloy Valve Stems

Line of bronze globe, angle and gate valves equipped with "Coradur" stems . . . . The new stem material is an aluminum-silicon bronze alloy designed to combat corrosion and dezincification. The manufacturer states that it combines a favorable machining index with excellent durability, light weight, high tensile strength and hardness. The alloy is also said to have a low coefficient of friction.

Manufacturer—R-P & C Valve Div., American Chain & Cable Co., Reading, Pa.

Insulation Tape

Anti-sweat insulation tape for cold water lines and air conditioning and refrigeration equipment . . . . It also is used as a gasket for metal flanges, wood and glass, and as a sound deadener or cushioner. The material is a black, rubbery tape composed of rubberized asphalt, cork and asbestos. The manufacturer states that it is non-volatile, odorless, resistant to water and has good adhesion to surfaces such as glass or metal. It reportedly retains its flexibility, adhesion and cohesion at temperatures between −20 and 158 F.

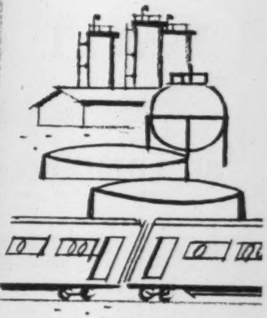
Manufacturer—Presstite Engineering Co., 3798 Chouteau Ave., St. Louis 10, Mo.

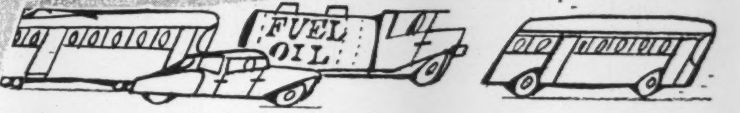
Flux for Gas Welding, Brazing

**All purpose "Uni-Flux" designed to be used for all types of gas welding and brazing. . . . The manufacturer states that it welds through coatings of lead, aluminum bronze, copper, rust, grease, paint, tar and dirt and brazes and welds cast iron, chrome metals, stainless, monel, etc. It cleans as it is used during welding and brazing operations. It is designed to eliminate impregnation of foreign substances into the metal surface by producing an inert atmosphere around the weld area. This keeps oxygen away from foreign substances by prohibiting the burning of these substances.

Manufacturer—Andco, Inc., 235 Throne Ave., Orchard Park, N. Y.

PHILA. OR BUST





EVERYBODY

(YES EVERYBODY!) IS COMING TO SEE WHAT'S NEW AT THE COMMERCIAL MUSEUM

PHILADELPHIA

MAY 16 THRU 20, 1954

20TH OIL HEAT SHOW

NATIONAL

Indoor Comfort

EXPOSITION

HEATING—COOLING

32ND ANNUAL OHI CONVENTION

AN INVITATION TO

Architects

and

Engineers

primarily interested in

COMMERCIAL-INDUSTRIAL JOBS

A special program has been arranged for you by the Institute's Commercial-Industrial members. You are invited to hear a short talk on heavy fuel oil handling and its combustion by a well-known authority. Following this talk, refreshments will be served.

Time: **5 until 7 P.M., Wednesday, May 19, 1954**

Place: **Room A, Commercial Museum, Philadelphia**

Yes, everybody interested in Automatic Oil Heating . . .

Architects, engineers, builders, contractors, dealers, distributors, wholesalers and jobbers—will fill all traffic lanes getting to *their* National Show to see what's new in heating and year 'round air conditioning.

No registration fee

There's no registration fee for anyone to see the exposition—it's free! And there's no fee for anyone to attend the general sessions at the 32nd Annual OHI Convention. Both affairs are under one roof—the Commercial Museum, Philadelphia, on May 16 thru 20. *So come!* See and learn what's new.

Service, Sales and Installation

Ideas a-plenty for you on new methods, new systems, new practices which you can take home and use—profitably. Questions will be asked and answered on *heating and cooling* at the convention's general sessions. They run from 9:30 A.M. 'til noon, Monday thru Thursday. The exposition is open at 1 P.M. Sunday, May 16, thru Thursday, May 20.

Better make hotel reservations now!

Advance hotel reservations are extremely heavy. Just drop a note to the Sales Department, Benjamin Franklin Hotel, Philadelphia. Tell them you're coming to the OHI Convention-Exposition; advise when you'll arrive and depart and the accommodations you want there or at the hotel of your choice. They'll do their best for you.

Come and see what's NEW

No registration fee for anyone

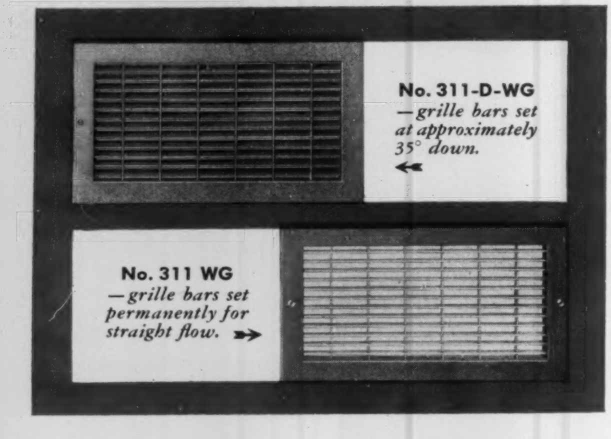
OIL-HEAT INSTITUTE OF AMERICA, Inc.

500 Fifth Ave., New York 36, N. Y.
Phone LOngacre 4-3755

Independent

"Fabrikated"
REG. U. S. PAT. OFFICE
WALL GRILLES

for Commercial Installations


No. 311-D-WG
—grille bars set at approximately 35° down.
No. 311 WG
—grille bars set permanently for straight flow.

1. Vertical or horizontal bars strengthened by interlocking cross bars; no vibration.
2. Tamper-proof. Changes in air distribution cannot be made by unauthorized persons.
3. Mesh ($\frac{3}{8}$ x $1\frac{11}{16}$) filters 78% of free area yet darkens the duct and reduces highlights from back of the grille.
4. 14 gauge steel solid bars ½" deep—strong enough to be "kick-proof"—a must for schools.
5. All bars made from round edge stock. No sharp edges. (A must for schools.)
6. The only grille for taking abuse in school gyms and hospital psychopathic wards.
7. Made in several large and small sizes.

Always Leading—Always Progressing

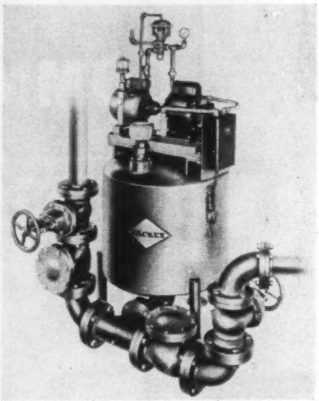
THE INDEPENDENT
REGISTER CO.
3747 E. 93rd STREET • CLEVELAND, OHIO

EQUIPMENT DEVELOPMENTS . . .

[Continued]

Pneumatic Sewage Ejector for Low Flows

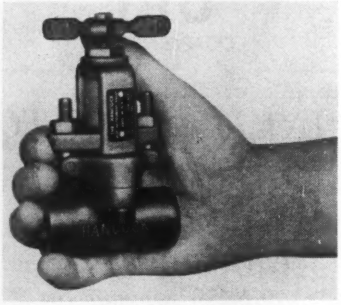
Packaged pneumatic sewage ejector for low flows . . . . "Packex" is designed for small buildings and subdivision lift stations, such as small apartment buildings, offices, small schools, trailer parks and small residential areas. According to the manufacturer, the unit has a capacity of up to 20 gpm with a 20 ft head and may be used with either a 3 or 4 in. inlet and discharge fitting. A hermetically sealed pot is designed to eliminate odor and gas.



Manufacturer—Yeomans Brothers Co., 1999 N. Ruby St., Melrose Park, Ill.

High Pressure Instrument Valve

New 6000 psi "Hancock" stainless steel instrument valve weighing 2¼ lb . . . . It is designed and engineered for such services as instrument panels and lines, gage, bypass and corrosive lines and orifice meters. The manufacturer states that its compactness permits close alignment of piping with near structures. The packing gland can be pulled tight in close quarters and disassembly is said to present no problem. The valve is available in ¼, ⅜ and ½ in. sizes.



Manufacturer—Manning, Maxwell & Moore, Inc., 65 Grove St., Watertown 72, Mass.

Blowers for Corrosion Service

*Two lines of exhaust blowers protected against corrosion and abrasion. . . . A compact, self con-

170
180
190
160
150
140
130
VACUUM
FAHRENHEIT
SELECTOR

"TUNE IN WITH THE WEATHER"

illinois Selectotherm®

Investigate this modern development in automatically controlled heating!—a high vacuum steam heating system that assures the ultimate in comfort, economy and convenience.

A **SINGLE DIAL CONTROL** "tunes in with the weather" — mild or severe — balancing heat supply against heat loss to provide an even and constant warmth that is always exactly right.

Illinois Selectotherm Systems are ideal for schools, hospitals, churches, apartments, commercial and public buildings *of any size*. They may be installed in new buildings or applied to existing buildings where boilers are used for low pressure steam heating only—with any type of fuel and any form of mechanical firing device.

Learn how Selectotherm with its reduced fuel consumption will save 20% or more compared to an ordinary heating system!

illinois ENGINEERING

ILLINOIS ENGINEERING COMPANY

2035 SOUTH RACINE AVENUE • CHICAGO 8, ILLINOIS

DIVISION OF AMERICAN AIR FILTER COMPANY, INC.

Send today for your copy of the new Selectotherm bulletin that gives interesting engineering data.

Illinois Engineering Company
2049 South Racine Avenue, Chicago 8, Illinois

Send at once____copies of Illinois Selectotherm Bulletin 540 on Controlled Heating.

Name________________Title__________

Company__________________________

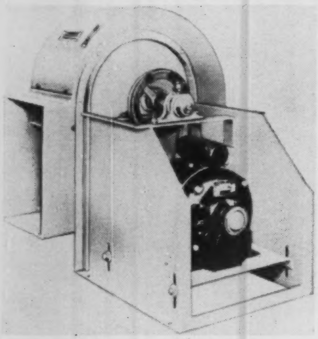
Street___________________________

City______________Zone____State_____

EQUIPMENT DEVELOPMENTS . . .

[Continued]

tained coated exhaust fan set, designed for services ranging from simple ventilating to handling of moderately corrosive atmospheres, is available in blower capacities from 300 to 7000 cfm. Units are supplied with either baked phenolic, vinyl or latex coatings for service with corrosive elements.

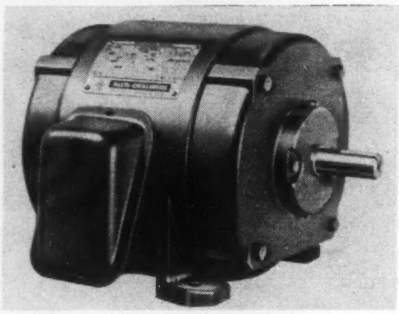


A line of heavy duty rubber covered blowers for service in severe corrosive or abrasive conditions is available in capacities from 750 to 54,000 cfm. Units are protected against fumes of sulfuric, hydrofluoric and other mineral acids by natural or neoprene rubber coatings.

Manufacturer—Heil Process Equipment Corp., 12901 Elmwood Ave., Cleveland, Ohio.

Induction Motors in New Frame Sizes

New line of a-c squirrel cage induction motors in frame sizes 326 and smaller following the new NEMA standards . . . . The new models have cast iron frames and end shields. Rotors are made of pressure-cast aluminum. Bearings are grease lubricated, medium series, double shielded ball bearings, designed to be relubricated without dismantling the motor. All totally enclosed motors are fan cooled. The company states the new motors will be initially available in frame sizes 182 and 184. Larger frame sizes will become available in approximately five-month intervals.



Manufacturer—Allis-Chalmers Mfg. Co., 1171 S. 70th St., Milwaukee 1, Wis.

Commercial Air Conditioner

**Unitized commercial air conditioner in 5 or 7½ hp. . . . Features include water, drain and elec-

COMBUSTIONEER

Modulating Controlled Stokers

Stop Over-Firing and Waste of Coal!

• Combustioneer's Modulating Controls automatically feed coal and air to the fire at *variable* rates, to meet load requirements, starting slowly, accelerating, tapering off, or stopping. This levels off peaks and valleys in feeding, prevents over-firing and waste of coal! Furthermore, Combustioneer's agitating transmission keeps the fire-bed always open, free burning . . . the automatic respirator controls air delivery for maximum combustion efficiency, and smoke-free stacks. The result . . . heat output is always balanced with the load demand.

Combustioneer Hopper and Bin-Feed Models range in capacity from 9 to 1000 lbs. per hour. They are precision made, rugged, giving long life in hard service.

Write today for your copy of Architects Heating Manual containing complete Combustioneer data and specifications.

Combustioneer Division
The Steel Products Engineering Company
1343 W. Columbia St., Springfield, Ohio

Bin Feed Model No. 15

Hopper Model No. 50

Combustioneer

Gas Burners • High and Low Pressure Oil Burners
Oil Furnaces • Stokers • Humidifiers

4 GOOD REASONS for specifying Watson-Stillman Forged Steel Fittings

Here's why **W-S FORGED STEEL FITTINGS** mean safe, dependable operation of your piping system:

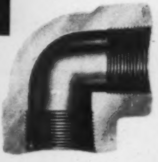
1. They're *drop-forged* to produce the well-known forged fiber structure with exceptionally high tensile and impact strength.
2. They're "Safety-Factor" designed with heavy walls where you need them. Extra long bands extend well beyond the last thread.
3. They're precision machined. Special automatic angle indexing machines maintain precise angular accuracy for perfect alignment. Long accurate threads insure tight joints.
4. They're fully inspected. Gauges double-check the close tolerances, angularity, threads and sockets and concentricity.

WATSON-STILLMAN FORGED STEEL FITTINGS give you maximum resistance to pressure, temperature, corrosion, shock and vibration. They protect your system against costly shut-downs.

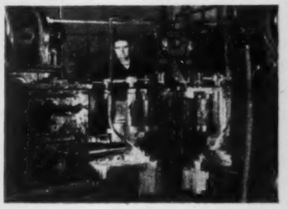
A complete line of forged fittings available in both SCREW-END and SOCKET-WELDING types in carbon, stainless and alloy steels. Write today for information.

Sold Through Leading Distributors

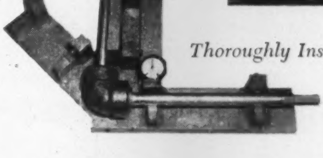
Drop Forged for Strength



"Safety-Factor" Design



Precision Machined



Thoroughly Inspected

WATSON-STILLMAN FITTINGS DIVISION

H. K. PORTER COMPANY, INC.

Roselle, New Jersey

The Automatic Air-Acetylene

TORCH-O-MATIC...

$AVES when you're using it!

$AVES when you're not!

and here's the exclusive reason why . . . TRIGGER-CONTROLLED FLAME

See that trigger in the picture? That's the secret of this time-saving, gas-saving, safer Torch . . . and it's a feature you'll find *only* on Torch-o-matic.

The instant you pull the trigger, the flame lights, and you're ready to go to work. No matches, no adjusting, no time wasted. Release the trigger and the flame shuts off. You don't have to wait for the line to clear before you safely move to another location. And when you're ready to work again, a pull of the trigger puts you in business. Add it up and you can quickly see how the on-and-off trigger control puts you ahead when you're using the Torch, saves you gas when you're not using it! Remember, a complete line of tubes and nozzles takes care of every job. Extension tips available for reaching around corners, into recesses. Fits your present equipment. Write for details.

● AND MORE SAFETY, TOO

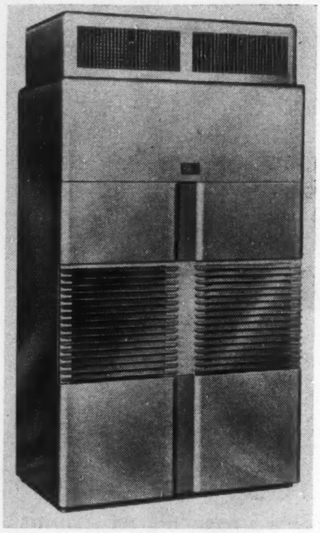
Because the Torch-o-matic shuts off *automatically* when the trigger is released, there is no danger of open-flame hazards to personnel or property. Too, the elimination of matches prevents another potential fire hazard.

VELOCITY POWER TOOL CO.
201 NORTH BRADDOCK AVENUE
PITTSBURGH 8, PA.

EQUIPMENT DEVELOPMENTS . . .

[*Continued*]

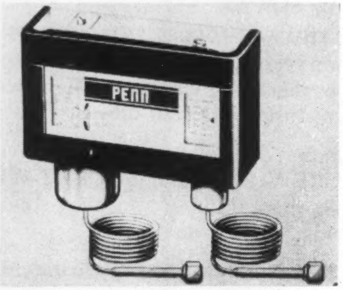
trical connections that can be made at either end or rear; instant water connections; oil-less fan bearings; and optional stainless steel exterior. Sight glasses, strainer-dehydrators, and non-chatter solenoids are standard equipment. Steam coils may be installed from the front of the cabinet with connections coming out either end.



Manufacturer—Koch Refrigerators, Inc., North Kansas City, Mo.

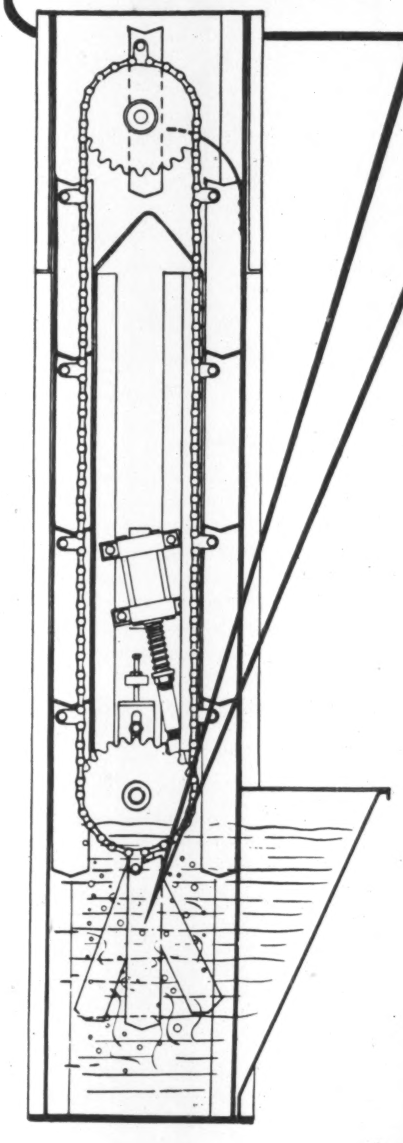
Dual Pressure Control for Air Conditioning

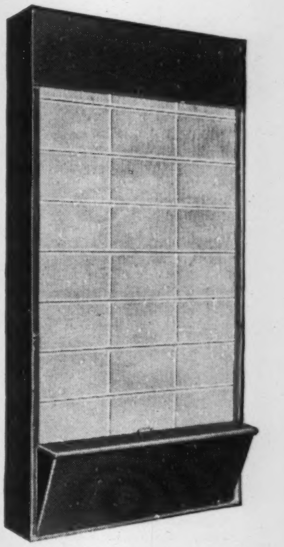
Dual pressure refrigeration control with lockout requiring manual reset on both high and low pressure . . . . Designed as a safety control for mechanical cooling applications, it is recommended for hermetic units for air conditioning. The control is available in either single pole standard duty, Type "271AP12AP," or double pole heavy duty, Type "273BP12AP," and for systems using either "Freon-12" or "Freon-22" refrigerants. Both types incorporate screwdriver adjustment and direct-reading calibrated scales. Standard duty models are rated for 1 hp single phase; heavy duty models to 1½ hp single phase or 3 hp polyphase. Controls are equipped with 36 in. copper capillary on both high and low pressure connections.



Manufacturer—Penn Controls, Inc., P.O. Box 556 Goshen, Ind.

Here's why Automaze new self-cleaning air filter STAYS CLEAN AS NEW!





EXCLUSIVE "pulse-type" action is the secret of the new Automaze automatic air filter. While each panel in the revolving curtain is submerged in the cleaning tank at the bottom, it is agitated vigorously 6 or more times by a compressed air drive. This cleans each panel thoroughly as well as completely renewing the adhesive. Result: Automaze filter panels stay clean as new!

The new Automaze goes 3 to 6 months without attention—a big improvement over stationary filters that may need cleaning once a month. Even after 6 months, all you need do is remove the sludge. A special reservoir cover makes this a quick, simple operation.

Filter panels are two inches thick. They are linked in an air tight revolving curtain with panels moving up and over, like the cars on a ferris wheel. The panels always keep the same face to the air stream. The dirty face of the filter is never on the downstream side. As a result, there's no possibility of dirt being blown off the filter into the cleaned air.

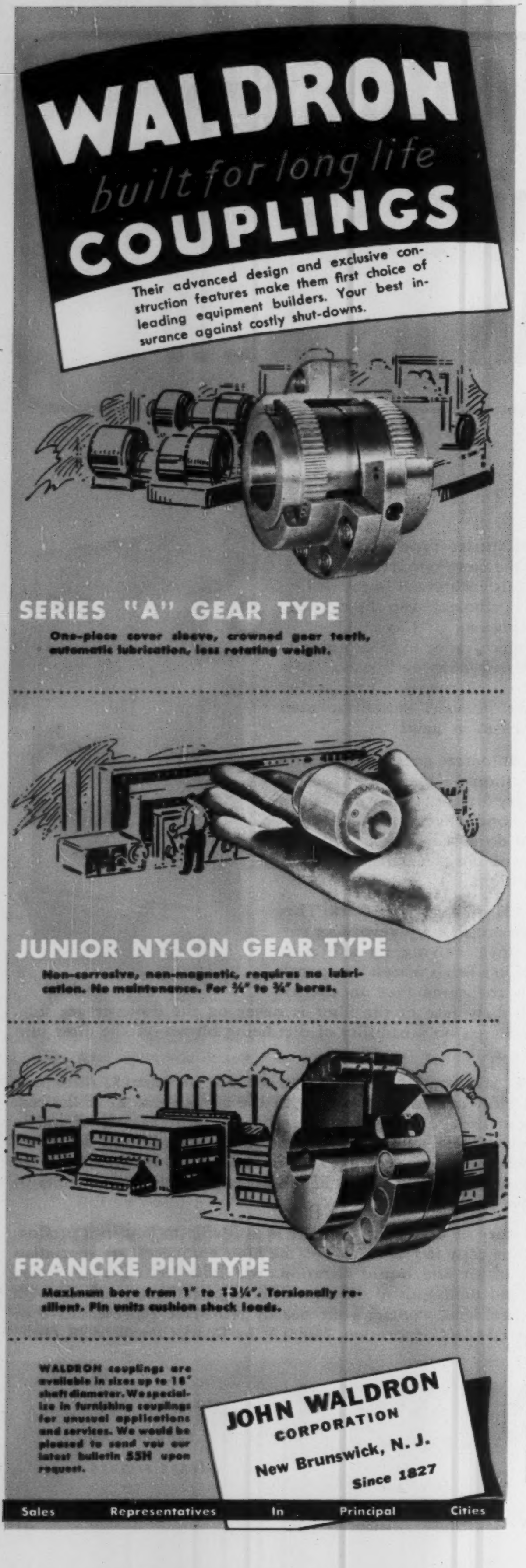
Automaze gives you other advantages too. For instance, **1.** Automaze has no electrical connections located in the air stream. **2.** If desired, Automaze can be operated by remote control. **3.** A variety of media designs are available to meet different filtering conditions. **4.** When sections are bolted together, there's no need for rigid mechanical drive connections to cause alignment difficulties—each filter section contains its own drive mechanism.

The full story of the new Automaze is available to you in a catalog. Write for your copy today. Air-Maze, the filter engineers, are specialists in all types of air and liquid filtration. We draw from over 29 years experience and thousands of different filter applications. For help with your filter problems, contact your nearby Air-Maze representative or write The Air-Maze Corporation, 25000 Miles Road, Cleveland 28, Ohio.

AIR FILTERS
SILENCERS
SPARK ARRESTERS

AIR-MAZE
The Filter Engineers

LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS



WALDRON

built for long life

COUPLINGS

Their advanced design and exclusive construction features make them first choice of leading equipment builders. Your best insurance against costly shut-downs.

SERIES "A" GEAR TYPE

One-piece cover sleeve, crowned gear teeth, automatic lubrication, less rotating weight.

JUNIOR NYLON GEAR TYPE

Non-corrosive, non-magnetic, requires no lubrication. No maintenance. For ½" to ¾" bores.

FRANCKE PIN TYPE

Maximum bore from 1" to 13¼". Torsionally resilient. Pin units cushion shock loads.

WALDRON couplings are available in sizes up to 18" shaft diameter. We specialize in furnishing couplings for unusual applications and services. We would be pleased to send you our latest bulletin 55H upon request.

JOHN WALDRON
CORPORATION
New Brunswick, N. J.
Since 1827

Sales Representatives In Principal Cities

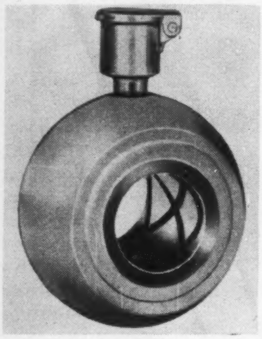
EQUIPMENT DEVELOPMENTS . . .

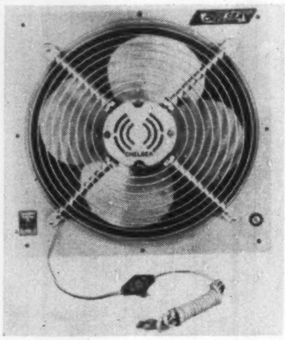
[*Continued*]

Light Duty Exhaust Fan

"Type BG" light duty exhaust fan for offices and other commercial establishments . . . . The fan is four-bladed, has a two speed semi-enclosed motor and comes with guard, switch, cord and plug. The fan frame consists of a heavy square panel without flanges. According to the manufacturer, this allows flush mounting the fan against the discharge opening in the wall. A true venturi orifice is designed to increase the air discharge efficiency of the fan.

Manufacturer—Chelsea Fan & Blower Co., Inc., 639 South Ave., Plainfield, N.J.


Ball Assembly


Fan

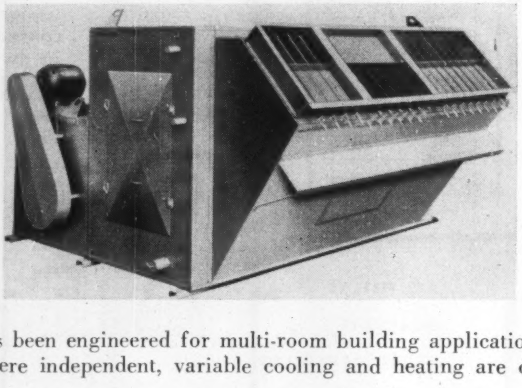
New Ball Assembly for Pillow Blocks

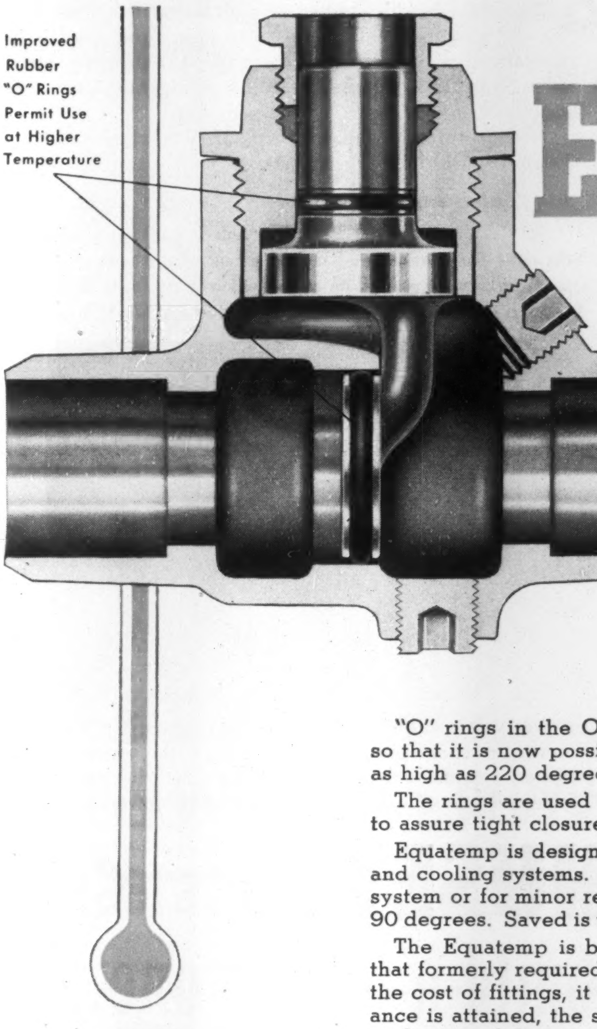
Previously made by machining a cast iron hollow ball, the ball assembly of the company's self aligning pillow blocks is now being made by forming steel to a true spherical shape . . . . According to the manufacturer, this new process reduces the cost of manufacturing, makes self alignment easier due to a smoother metal surface and features a larger oil reservoir. The assembly is available with graphited bronze bushings or with sintered bronze bushings in sizes from ½ in. to 1 in.

Manufacturer—Randall Graphite Bearings, Inc., 1000 S. Greenlawn Ave., Lima, Ohio.

Multi-Zone Air Conditioner

Multi-zone air conditioning unit known as the "Flexazone" central plant air conditioner . . . . It has been engineered for multi-room building applications where independent, variable cooling and heating are de-





EQUATEMP®

temperature raised to 220° F.

Increase applications for O-B Balancing Valve

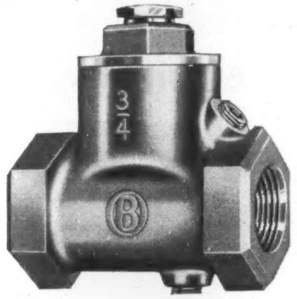
"O" rings in the O-B Equatemp Balancing Valve have been improved so that it is now possible to use the valves on heating systems operating as high as 220 degrees F., at 100 pounds gage pressure.

The rings are used in two places in the valve, in the butterfly type disc to assure tight closure and in the stem to prevent leakage.

Equatemp is designed for regulating water flow in the piping of heating and cooling systems. When shutoff is needed for purging or draining the system or for minor repairs, it can be closed merely by turning the stem 90 degrees. Saved is the expense of draining and refilling the entire system.

The Equatemp is both a balancing and a shutoff valve. It does a job that formerly required two or more valves and fittings. Besides reducing the cost of fittings, it saves space and installation time. Once proper balance is attained, the setting can be locked by tightening the packing nut at the top of the stem.

For additional information, call your Ohio Brass distributor or send the coupon below for Folder 1297-V which describes the O-B Equatemp and its many applications in heating and cooling systems.



Ohio Brass
MANSFIELD OHIO, U. S. A.

TYPES AND SIZES

The No. 37 solder-type Equatemp for tubing installations can be furnished in ⅜, ½ and ¾-inch sizes. The No. 38 Equatemp, with threaded pipe ends, is available in ½, ¾, 1, 1¼ and 1½-inch sizes.

TYPICAL APPLICATIONS IN HEATING AND AIR CONDITIONING

Floor
Ceiling
Baseboard
Panel
Unit Heaters
Convector
Unit Air Conditioners

OHIO BRASS COMPANY
Mansfield, Ohio

Please Send me the new Equatemp folder, 1297-V.

Name ....

Company ....

Street ....

City .... **State** ....

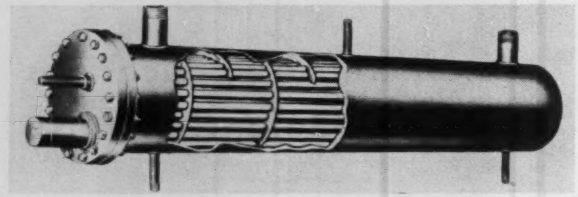
4461-V

sired. The unit consists of a blower section, coil section and damper section. The company states that the unit can be field-assembled in 24 different ways. A new damper arrangement is designed so that zones may be added or changed. Air flow may be either horizontal or angular. In operation, incoming air is blown past the heating or cooling coils and is discharged through the individually controlled dampers in separate air streams at varying temperatures.

Manufacturer—Drayer-Hanson, Inc., 3301 Medford St., Los Angeles 63.

Direct Expansion Liquid Chiller

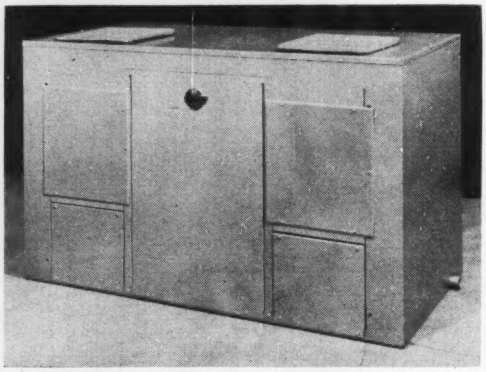
Direct expansion liquid chiller constructed with refrigerant in the tubes and water in the shell . . . . The liquid refrigerant is distributed to the tube circuits through one or more distributors, each distributor being fed by a thermal expansion valve. According to the manufacturer, positive oil return is assured by incorporating downfeed with ample refrigerant circuit velocities. This is designed to eliminate oil trapping and provide for accelerated oil return from the chiller. Internally finned tubes are said to eliminate the low refrigerant side coefficient.



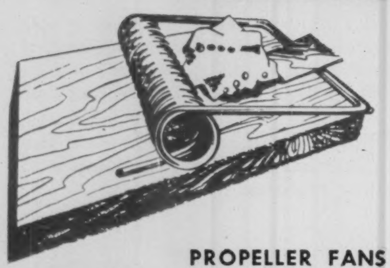
Manufacturer—Kennard Corp., 1819 S. Hanley Rd., St. Louis 17, Mo.

Air Cooled Air Conditioner

Five hp air cooled packaged air conditioner for commercial use in areas where water supplies are inadequate . . . . The unit measures 58 in. wide and 35 in. high and may be installed outside the building. Designated as "Model 1205," the unit features a 1750 rpm hermetic compressor. According to the manufacturer, the air conditioner is designed for use with any one of six evaporator coils or evaporator-coil-blower assemblies



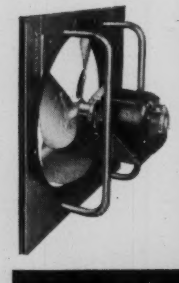
The **MASSACHUSETTS** *Line*®



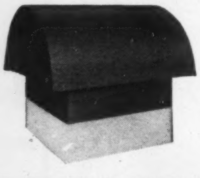
If YOU build a better one.....

It's an old chestnut and the world is not beating a path to our door BUT we DO have a better line of . . .

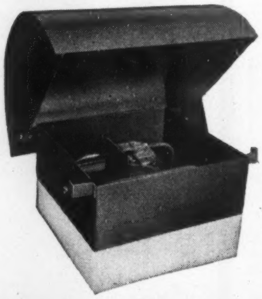
HEATING and VENTILATING EQUIPMENT



PROPELLER FANS
New Venturi-type Belt drive 24" to 48" wheel diameters, direct drive 12" to 30" diameters.
A complete line of accessory items are available.
Write for Bulletin No. 117



POWER ROOF VENTILATORS
Propeller Fan type available in six sizes direct driven and five sizes belt driven, and features the Venturi-type orifice.
Write for Bulletin No. 119



MASSACHUSETTS BLOWER DIVISION
The **BISHOP & BABCOCK** *Mfg. Co.*
4901 HAMILTON AVENUE • CLEVELAND 14, OHIO

TRI 55 CLAD THE LEADER
REG. U.S. PAT. OFF.
IN MODERN MOTOR DESIGN

Sound-room tests prove TRI 55 CLAD motors operate at greatly reduced noise level!

REG. U.S. PAT. OFF.

Here's the new motor engineered and built for the fast growing air conditioning industry. It's the quieter, more compact G-E Tri/Clad '55' motor, in ratings from 1 to 30 hp a-c.

To reduce noise, G. E. engineers developed a new concept—a sonant motor—a motor that sounds pleasing to the ear. They studied, and then reduced, the causes of motor noise—bearing rattle, magnetic hum, and windage. Sound room tests prove the Tri/Clad '55' is sonant, runs quieter.

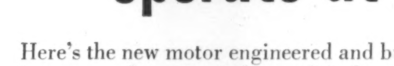
In addition, the modern looking Tri/Clad '55' motor is lighter and smaller—saves weight, saves space.

Try this new motor. See for yourself how the Tri/Clad '55' can help reduce noise and save space in your own equipment. Contact your G-E Apparatus Sales Office or G-E Motor Supplier today. For bulletins, write General Electric Co., Section 648-12, Schenectady 5, New York.

Progress is our most important product

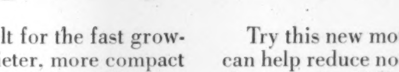
GENERAL ELECTRIC

LIGHTER, SMALLER



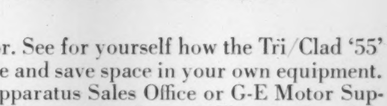
MORE COMPACT MOTOR means more horsepower per pound—saves space, weight—is easier to handle.

BETTER INSULATION SYSTEM



SILICONE RESIN COATING on stator plus stronger polyester-film slot and phase insulation increase electrical life.

BETTER PERFORMANCE



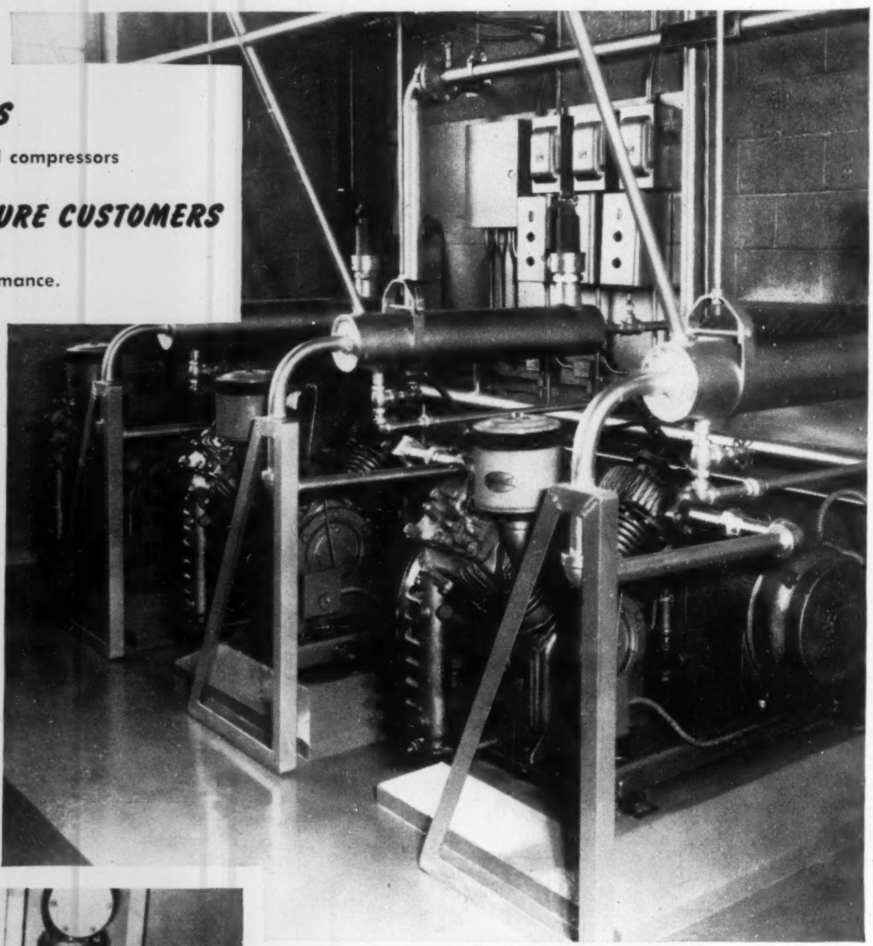
HIGHER FULL LOAD SPEEDS is typical of many performance improvements in the new Tri/Clad '55' motor.

HOW TO WIN FRIENDS

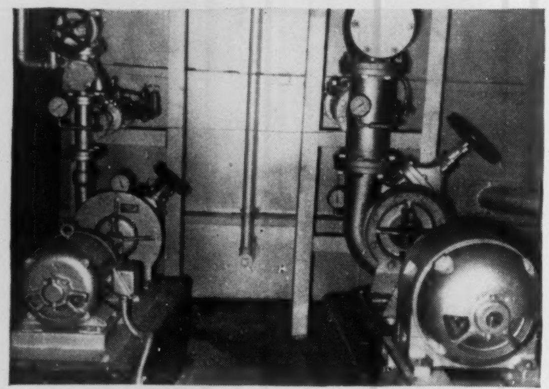
Install quality pumps and compressors
by Gardner-Denver.

AND INFLUENCE FUTURE CUSTOMERS

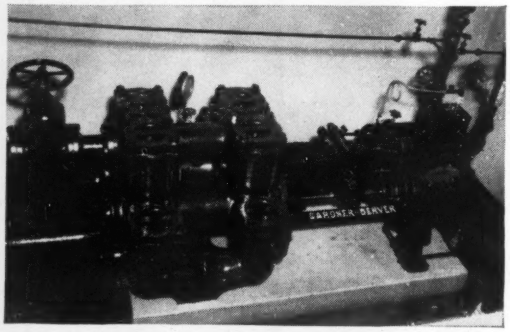
Keep your own records
on Gardner-Denver performance.



Compressors for sprinkler systems, soot blowing and general compressed air supply.



Centrifugal pumps for hot or chill water circulation, water supply and other pumping services.


GARDNER-DENVER

Steam pumps for boiler feed, processing and liquid transfer service.

SINCE 1859

GARDNER-DENVER

PORTABLE COMPRESSORS
UTILITY DRILLS
JACK HAMMERS
Bolt, Pin & Spike Drivers
PAVING BREAKERS
TAMPERS & RAMMERS
CLAY SPADERS
TRENCH DIGGERS
SUMP PUMPS
AIR HOISTS
DRILL STEEL SHARPENERS
AIR LINE OILERS

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS
FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 13, Ontario

EQUIPMENT DEVELOPMENTS . . .

[*Continued*]

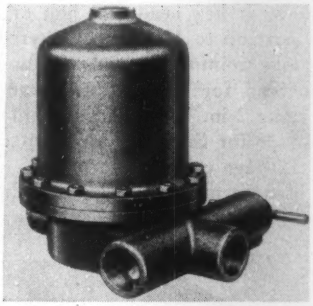
produced by the firm. Condenser blowers may be rotated 90 deg for air discharge through either the side or top of the unit. All necessary controls are wired and built in at the factory.

Manufacturer—Airtemp Div., Chrysler Corp., 1600 Webster Ave., Dayton 1, Ohio.

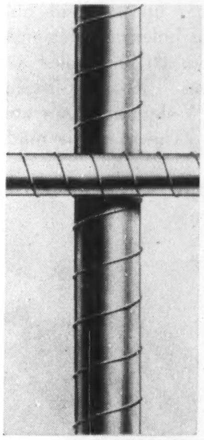
Reverse Flushing Filters

**New models of reverse flushing filters for industrial and commercial applications, Model "H" 1 in. pipe connection and Model "K" 2 in. pipe connection . . . . "Por-O-Met" filters are designed to remove suspended foreign matter in liquids. Elements are made of either sintered bronze, micro-porous porcelain or porous "Alundum" and are available over a range of grade sizes for removing foreign matter from passing sizes of 100 microns down to 0.5 of a micron. Flow rate is in proportion to pipe carrying capacity. The manufacturer states that no replacement of filter elements is required. Removal of collected foreign matter is accomplished by a push-pull of a reverse flushing plunger.

Manufacturer—The Homefiltr Co., North Brookfield, Mass.



Above: Filter



Left: Pipe

Light Weight Pipes and Ducts

**New type of light weight pipe manufactured under the name of "Spiraline" . . . . The pipe is made of strip material with a spiral lockseam to give it strength and rigidity. The interior of the pipe is smooth to offer low resistance to the flow of air, liquids or gases. Typical applications include warm air heating ducts, ventilating and air conditioning installations. It may also be adapted to pipe lines, protection of underground or concrete covered cables and downspouting. The pipe can be supplied in exceptionally long lengths when required for special jobs.

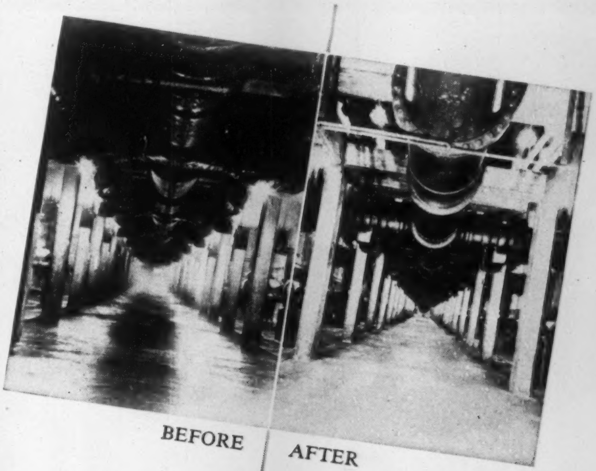
Manufacturer—Dahl Corp. of America, 29 Broadway, New York 6.

Continuous Air Diffusers

Addition of continuous air outlets to line of "Agitair" air diffusers . . . . The new units in-

how

pipe galleries stay dry



surrounded by cold water

The pipe galleries in Chicago's water filtration plant are surrounded by Lake Michigan water, as cold as 40° F. Before Kathabar, condensation literally created a fog in the galleries, corroded expensive equipment, rotted wiring, peeled off paint.

Moisture removal by refrigeration was impractical under the conditions prevailing. Kathabar dehumidifying units completely dried up the galleries by lowering the dew point of the air. Eliminating the condensation damage, the Kathabar units pay for themselves in less than 3 years.

This is one of the many contributions of Kathabar humidity engineering. It is used for the packaging, processing, storage, and testing of many products. By preventing frost, condensation, corrosion, and supplying direct dehumidification, Kathabar saves money and improves product quality.

Wherever atmospheric moisture is a problem, Kathabar engineers will be glad to help you find a cost-saving solution.

Write for literature
Group K-53-4.

Kathabar
HUMIDITY CONDITIONING

SURFACE COMBUSTION CORP., TOLEDO 1, OHIO

ALSO MAKERS OF

Surface INDUSTRIAL FURNACES **Janitrol** AUTOMATIC SPACE HEATING

DOWN-DRAFT VIEW

Gate opens outward to relieve down drafts which might affect flame. An optional safety switch closes main gas valve in case of prolonged down draft, thus providing full protection.

UP-DRAFT VIEW

Gate opens inward to regulate updrafts in conventional, proven manner, checking any excess in draft.

field

"MG" Draft Controls

ENGINEERED SPECIFICALLY FOR

GAS

fired industrial and commercial plants

1. Double acting gate opens inward to regulate up-drafts and outward to relieve down-drafts.
2. Adding or taking off weights provides simple adjustment for up-draft conditions at time of installation.
3. Control will relieve internal or down-draft pressures of only a few thousandths of an inch.
4. Weights attached to gate itself are factory set to insure extreme sensitivity to down-draft conditions.
5. Corrosion resistant knife edge bearings resting on self-aligning bearing plates assure extreme sensitivity yet long life.
6. Side wings improve the regulation, making the control accurate at all gate positions.
7. Long collar keeps gate out of the path of flue gases — resulting in greatly increased life.

The Field "MG" has met the most rigid municipal requirements for commercial and industrial installations. It is being used with full approval of the nation's leading gas companies in the nation's largest cities. Fully safe, fully proven, it provides for gas-fired installations the same accurate, dependable performance, the fuel economy so long provided by Field Draft Controls for oil and coal fired furnaces. Write for complete information.

FIELD CONTROL DIVISION

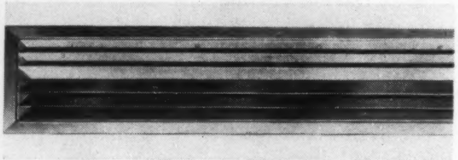
of H. D. Conkey & Company — Mendota, Illinois

AFFILIATES: Conco Building Products, Inc. — Brick, Tile, Stone
Conco Materials Handling Division — Cranes, Hoists

EQUIPMENT DEVELOPMENTS . . .

[Continued]

corporate patented diffusing vanes to give "unvaried distribution of noiseless, draftless conditioned air over a predetermined area." They are available in unlimited run dimensions for either sidewall or ceiling installation. "Model RC" has a separate mounting frame and interchangeable diffusing core, and "Model R" has an integral diffusing core. The manufacturer states that both types conform to troffer or fluorescent lighting and other architectural considerations.

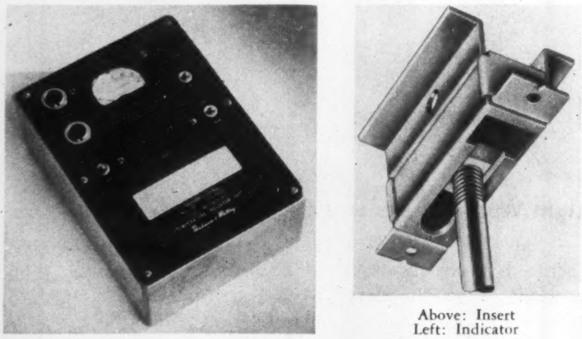


Manufacturer—Air Devices Inc., 185 Madison Ave., New York 16.

Concrete Insert for Piping, Ducts

Spot concrete insert designed for suspension of piping, electrical conduit, heating and ventilating ducts, etc . . . . The company states that it will take any square or hex head nut, bolt or hanger up to ½ in. and support up to 1000 lb. Centered side holes are designed to take reinforcing rods up to ⅜ in. Drilled holes are provided for nailing into wood forms. A keyhole slot permits 2 in. hanger adjustment and V-slots at either end provide for lining up and centering. The insert is made of 12 gage cold rolled steel.

Manufacturer—Unistrut Products Co., 1013 W. Washington Blvd., Chicago 7.



Above: Insert
Left: Indicator

Thermistor Type Temperature Indicator

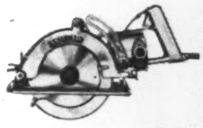
"Climate-Survey" temperature indicators available in three models . . . . "Model 196" has six overlapping ranges spanning from −70 to 60 F; "Model 197," six overlapping ranges spanning from 10 to 140 F; and "Model 198," has a single range from 60 to 90 F. All are battery operated for portability. The sensing units, which consist of thermistor pairs in parallel, are hand calibrated and a standardized replacement service is available. Each instrument is provided with two input receptacles and a selector switch so that reference temperature or wet and dry bulb readings can be made. Readings

ON EVERYDAY SAWING . . . OR ON CUTTING TOUGH METALS, PLASTICS OR COMPOSITIONS

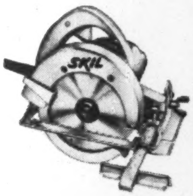
"SKIL has the answer"

TO ALL SAWING PROBLEMS!

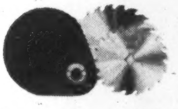
with a specialized model and blade or disc for every job!



9 Extra-Heavy Duty SKIL Saws with high-torque worm drive. The favorite type for over 25 years on heavy ripping, tough metal and compositions that no other saw can handle. Here is your assurance of absolutely minimum maintenance in heaviest service. Blade diameters from 6" to 12".



3 Heavy Duty SKIL Builders Saws with high blade speed. Low in cost, light weight and easy handling, the new SKIL Builders Saws are ideal for quick cut-off work—for use with abrasive cut-off wheels. Many features found only in far costlier saws. Blade diameters: 6", 7¼", 8¼".

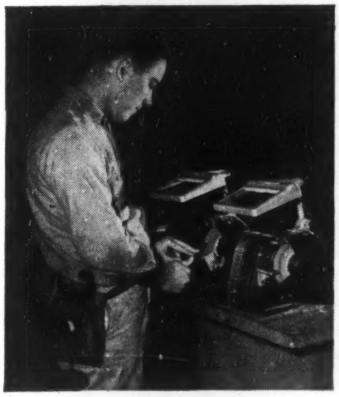


98 Specially Designed SKIL Blades and Abrasive Cut-off Wheels carried in stock by SKIL Branches and distributors. With the proper SKIL Saw, you can efficiently cut any material encountered in the metal working field with substantial savings in time and money!

FREE! New SKIL Blade Selector to help you solve cutting problems. Shows the blade and SKIL Saw to cut practically every material used in production and plant maintenance. Ask your SKIL distributor or send coupon.

FREE! Test Cutting Service on your problem materials. Send us samples of materials and details of any cutting problems in your plant. We'll let you know the SKIL Saw and blade to answer your problem.

Two New SKIL 6" Bench Grinders save steps . . . speed production



Carrying tools or work to distant bench grinders is a "bottleneck" you can break by spotting several of the new 6" SKIL Bench Grinders in strategic locations. Features: safety indicator light; removable wheel guards, covers; adjustable spark arrestors, tool rests; built-in dust exhaust chutes.

SKIL
SAW & BLADE SELECTOR

FREE! Ask for a Demonstration and a FREE Trial of the SKIL Saw with the exact SKIL BLADE or CUT-OFF wheel to solve your toughest cutting problem.

SKIL
PORTABLE TOOLS

Made only by SKIL Corporation, formerly SKILSAW, Inc.
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Factory Branches in All Leading Cities

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☐ I would like a SKIL Blade Selector
☐ I would like a demonstration and free trial
☐ Please send literature on SKIL tools

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Company______________________
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Only the
d-h Flexazone
Central-Plant
Air Conditioner
Gives you

24 ARRANGEMENTS!

ZONES EASILY FIELD ALTERED!

HORIZONTAL OR VERTICAL DISCHARGE!

PLUS
D-H EXCLUSIVE DAMPER ARRANGEMENT

Gives independent, variable control for as many as 7 separate zones

Flexibility—that's the *extra* you get with Flexazone! Only Flexazone can be assembled 24 different ways, depending upon available space—*in the field*. Only Flexazone allows you to add or change zones at any time—*in the field*. And only Flexazone gives you a choice of horizontal or angular air flow from the plenum. These *exclusive* features pay off in cheaper installation, greater design-freedom and lower costs—important benefits, whether you're a contractor, architect, engineer, or building owner!

Want to learn more about Flexazone? Write for bulletin C-4.22.

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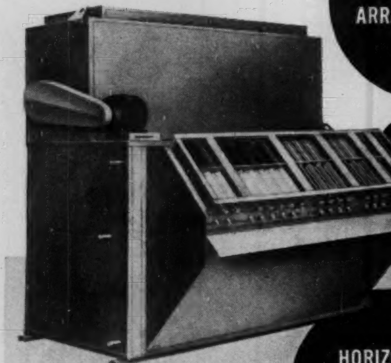


EQUIPMENT DEVELOPMENTS . . .

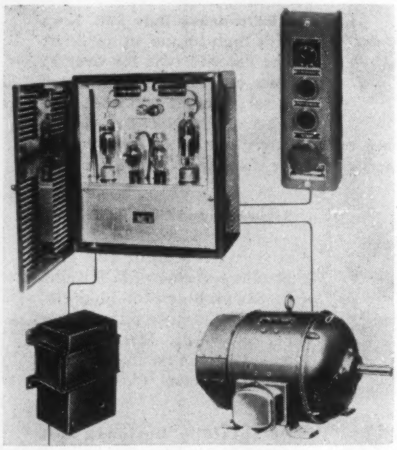
[*Continued*]

are made from a 3 in. sq temperature-compensated meter at a response time of six seconds for 95 percent of steady state conditions.

Manufacturer—Beckman and Whitley, Inc., 1002 E. San Carlos Ave., San Carlos, Calif.

Adjustable Speed Drive

Stepless adjustable speed drive, the "Electronic Select-A-Spede," for applications where flexibility and close speed control are necessary . . . . It is designed for operation from a-c power lines and is available with d-c drive motors in standard NEMA frame sizes, ¾ to 15 hp. The unit is built with speed ranges of 5 to 1, 20 to 1, or 50 to 1. It consists of an anode transformer, electronic control panel, pushbutton station and a specially designed adjustable speed d-c drive motor. Standard safety features include a fail-safe circuit in case of tube failure, and current limit control to guard against overload, jamming or too rapid acceleration.



Manufacturer—The Louis Allis Co., 427 E. Stewart St., Milwaukee 7, Wis.

Air and Gas Leak Detector

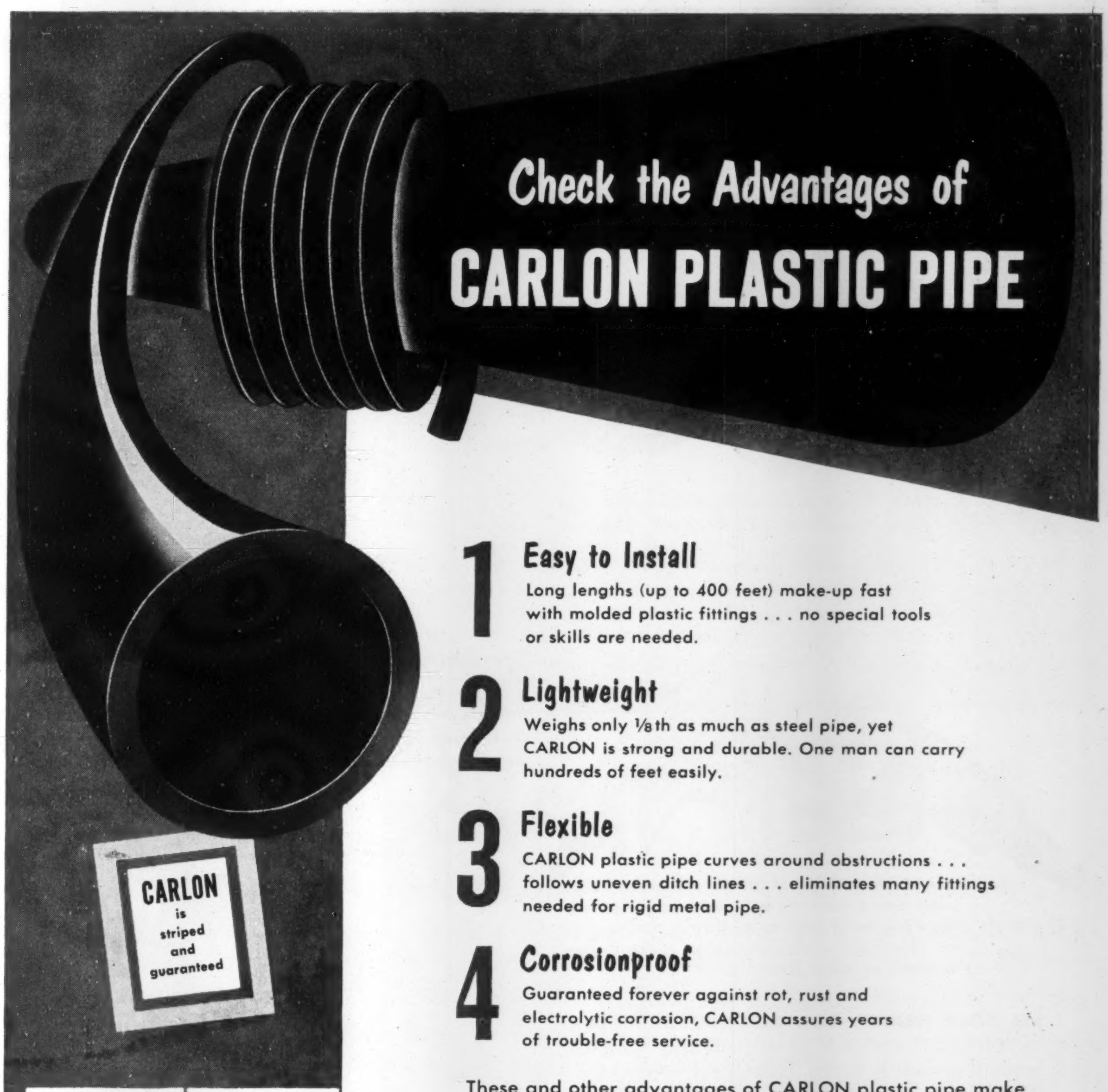
**"Leak-Tec," a special liquid for detecting minute leaks where gas and air are used. . . . The fluid is squirted from a specially designed plastic bottle on surfaces or around piping and penetrates rust scales or cracks, and creeps over surfaces creating bubbles where the leak occurs. No brushing is required. The manufacturer states that it is non-flammable, non-explosive and non-injurious to the person using it.

Manufacturer—American Gas & Chemicals, Inc., 45 Rockefeller Plaza, New York 20.

Regulators for Welding Gases

"Series 8900" regulators designed for use with gases supplied by pipe line systems using comparatively low pressures. . . . These oxygen cutting and welding regulators supersede "Series 8600" and give greater flow capacities with improved regulation and lower

Check the Advantages of
CARLON PLASTIC PIPE

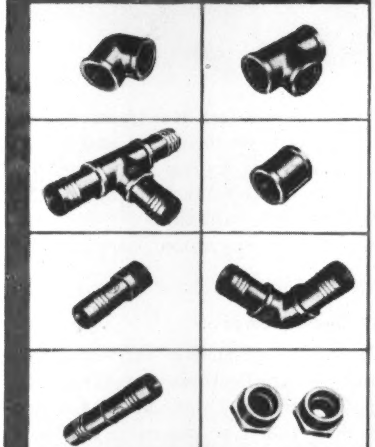


1 Easy to Install
Long lengths (up to 400 feet) make-up fast with molded plastic fittings . . . no special tools or skills are needed.

2 Lightweight
Weighs only 1/8th as much as steel pipe, yet CARLON is strong and durable. One man can carry hundreds of feet easily.

3 Flexible
CARLON plastic pipe curves around obstructions . . . follows uneven ditch lines . . . eliminates many fittings needed for rigid metal pipe.

4 Corrosionproof
Guaranteed forever against rot, rust and electrolytic corrosion, CARLON assures years of trouble-free service.



These and other advantages of CARLON plastic pipe make it tops for all medium temperature, medium pressure jobs . . . air conditioning ducts . . . drinking water systems . . . radiant heating lines . . . handling corrosive fluids, gases and vapors. Millions of feet of CARLON in thousands of installations throughout the nation have proved that a superior piping system can be installed for less.

Buy the Pipe with the Stripe!

CARLON PRODUCTS CORPORATION *Pioneers in Plastic Pipe*

10562 MEECH AVE. • CLEVELAND 5, OHIO

Write today for literature

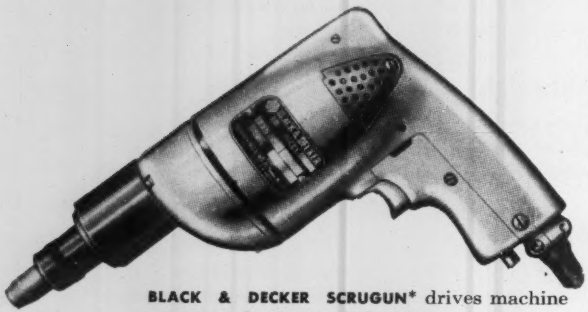
1720-CP

Manufacturing plants in Ohio, Colorado, N. Carolina, Oregon, Texas and Ontario—Export: H. E. Botzow, New York

Speed up Assembly!

Switch to BLACK & DECKER POWER!

BLACK & DECKER HOLGUN* drills holes to ¼" diam. in steel, to ½" diam. in hardwood Perfectly balanced, light in weight, compact, easy to handle, accurate. Famous "Pistol Grip and Trigger Switch."



BLACK & DECKER SCRUGUN* drives machine screws and nuts to ¼", self-tapping screws to #12, wood screws to #10 x 2". Positive or adjustable clutch available. Same design features as B&D HOLGUN!

SEE YOUR NEARBY B&D DISTRIBUTOR for demonstrations and full details on this famous team of assembly tools. They'll help your men turn out more work, with less fatigue and less spoilage. And you have nearly 50 other B&D Drill and Screw Driver models to choose from to fit your needs on heavier work! Write for free catalog to: THE BLACK & DECKER MFG. Co., 640 Pennsylvania Ave., Towson 4, Md.

*Trade Mark Reg. U. S. Pat. Off.

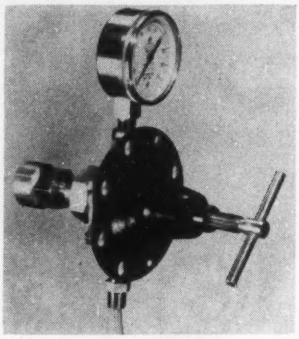
SHEARS SANDERS BENCH GRINDERS HAMMERS

LEADING DISTRIBUTORS EVERYWHERE SELL
Black & Decker
PORTABLE ELECTRIC TOOLS

EQUIPMENT DEVELOPMENTS . . .

[*Continued*]

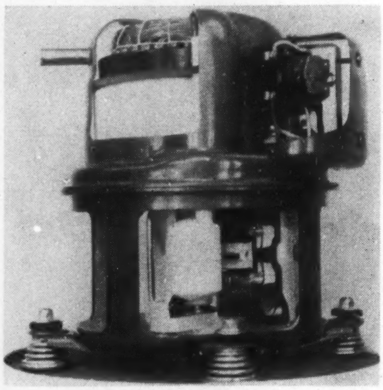
static increment. The company states that regardless of fluctuation in the line pressure, these regulators maintain a steady gas pressure. They are of the inverse-type design and feature a seating arrangement which requires no nozzle.



Manufacturer—Air Reduction Sales Co., 60 E. 42nd St., New York 17.

Compressors for Window Air Conditioners

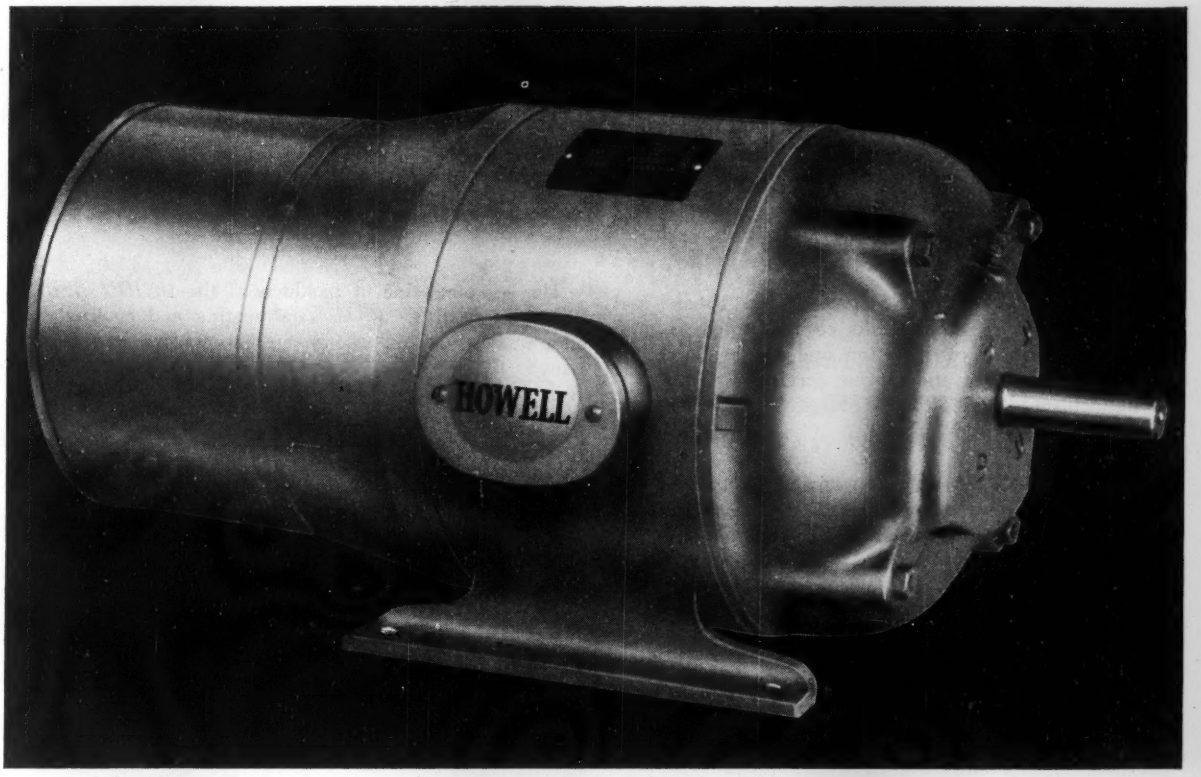
New twin-cylinder type welded, hermetic motor-compressors for window air conditioners . . . . A cork alignment ring is designed to control the air gap surrounding the motor to reduce noise and yet keep the motor close to the shell to permit fast heat transfer. Motor starting relays are current type on the ½ hp and light ¾ hp, potential type on the heavy ¾ hp and 1 hp. A sensitive three terminal type overload protector is furnished. Suction and discharge mufflers are built in.



Manufacturer—Copeland Refrigeration Corp., Sidney, Ohio.

Self Contained Air Conditioner

Self contained "Hi-Boy" air conditioner for year 'round commercial applications . . . . The unit is being made in 2, 3, 5, 7½, 10 and 15 ton sizes. Construction features include deflection type discharge grilles arranged so that both vertical and horizontal direction of the air can be controlled, replaceable filters, acoustic in-



HOWELL BRAKE MOTORS

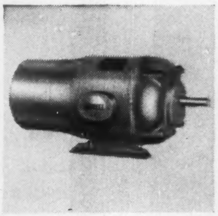
For sudden stopping, quickly and surely—there's a Howell Brake Motor that fits your exact needs!

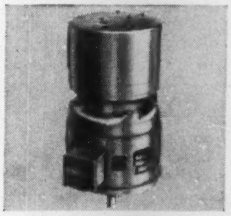
The Howell Brake Motor is designed for use in those applications where rapid stopping of rotation is required. Howell Brake Motors are used extensively on such machines as lathes, planers, drill presses and dumbwaiters.

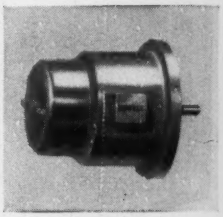
Quick stoppage can be accomplished on motors of all types in most sizes. Brakes are of standard construction for long life and trouble-free operation.

Howell Disc Brakes are integrally mounted, simple in design, easily accessible and quickly adjusted. For complete details on using Howell Brake Motors in your operation, contact the Howell man in your area, or write the factory for Bulletin BR-1 and further information.

Three types of Howell Brake Motors


Howell General Purpose, Dripproof, Horizontal Motor (Type SC) for wall mounting, with integrally-mounted disc brake.


Howell Vertical Face-Mounted Motor with 50 ft.-lb. brake. Howell Brake Motors fit a wide variety of applications.


Howell Special Horizontal Flange-Mounted Pancake Motor with 3 ft.-lb. brake. This streamlined motor is unusually compact.

HOWELL Red Band MOTORS

HOWELL MOTORS

HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICHIGAN

PRECISION-BUILT MOTORS FOR INDUSTRY SINCE 1915

EQUIPMENT DEVELOPMENTS . . .

[*Continued*]

sulation and adaptability for installation either with or without air ducts.

Manufacturer—United States Radiator Corp., 300 Buhl Bldg., Detroit 31, Mich.

EQUIPMENT BRIEFS . . .

STANDARD CONDENSERS for use with "Freon" and "Genetron". . . . These units cover a range from 5 through 120 tons of refrigeration and are available for both industrial service and marine service.

Manufacturer—Doyle & Roth Mfg. Co., Inc., 136-50 24th St., Brooklyn 32, N. Y.

ELECTRIC DEHUMIDIFIER which is lightweight and features a compressor 33 percent more efficient than the company's model of last year. . . . The manufacturer states that the unit can remove up to 14 quarts of moisture from the air every 24 hr, gives adequate humidity control in rooms up to 12,000 cu ft, and can be moved from room to room.

Manufacturer—Radio Corp. of America, 30 Rockefeller Plaza, New York 20.

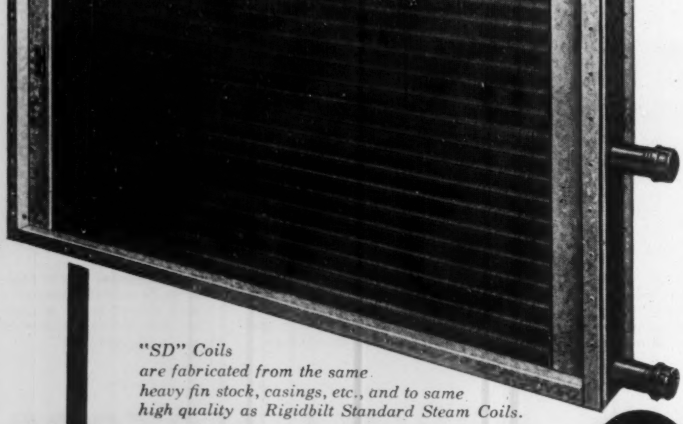
PERMANENT MAGNET which is pocket-size, to be used as a recovery tool . . . . At one end, a standard pipe nipple drilled with a 3/16 in. hole allows a rope or wire to be passed through it so that the magnet can be lowered into vertical pipes. In steel pipes the magnetic attraction of the tool to the walls of the pipe is prevented by a feature incorporating two removable neoprene rings which slip around the recovery tubes.

Manufacturer—Eriez Mfg. Co., Erie, Pa.

The complete line of products of the *UNION ASBESTOS and RUBBER CO.'s* new heating and cooling division was introduced to sales representatives at the company's first annual sales convention held in Chicago recently. New products include a patented turbilizer in the steel tubing on its convector radiators; a new design in its unit heater line and new features on the "Florvectors." In addition, features of the new air conditioning units were described.

A new refrigerant warehousing system to provide faster service and prepaid shipments to wholesalers' warehouses went into operation last month, according to an announcement from Du Pont's *KINETIC CHEMICALS DIV.* Under the new plan, 26 regional warehouses will stock "Freon-12" in 10, 25 and 145 lb cylinders, "Freon-11" in 200 lb drums and "Freon-22" in 9, 22 and 125 lb cylinders. Shipments will be made to the warehouses of authorized distributors and wholesalers free of charge, with most of the shipments by truck.

RIGIDBILT STEAM DISTRIBUTING TUBE HEATING COILS



"SD" Coils are fabricated from the same heavy fin stock, casings, etc., and to same high quality as Rigidbilt Standard Steam Coils.

For heating jobs where regulated steam control is needed, RIGIDBILT Steam Distributing Coils are ideal. Uniform steam distribution is provided throughout entire length of coil, even when low throttled. Coils consist of 2 separate sets of tubes, one within the other, spaced by separators, and each free to expand or contract. Special construction keeps condensate warm.

RIGIDBILT IS BETTER BUILT—Write for Catalog

RIGIDBILT INC.

2852 W. FULTON ST., CHICAGO 12, ILLINOIS

FAST DELIVERY!

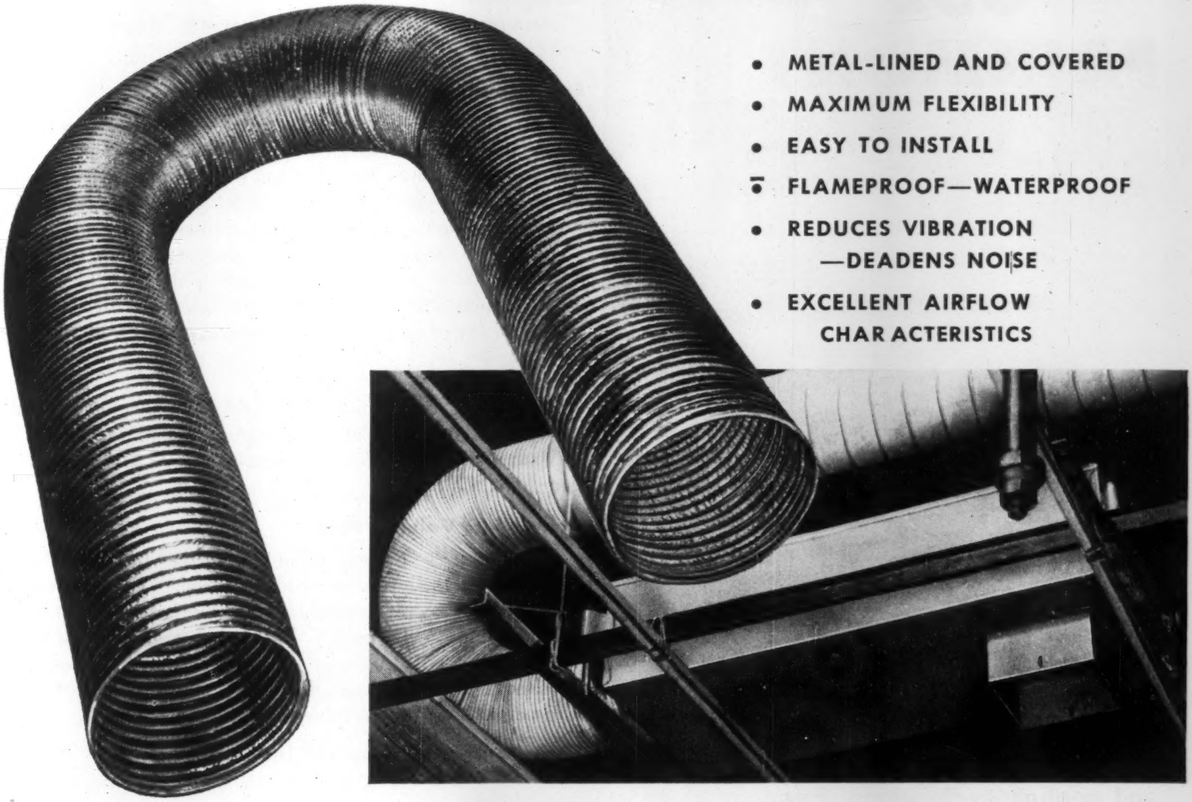
AIR CONDITIONING & VENTILATING UNITS • UNIT & PRODUCT COOLERS • HEATING & COOLING COILS
ALSO COILS DESIGNED AND BUILT FOR SPECIAL APPLICATIONS

Thermaflex:®

NEW FLEXIBLE AIR DUCT

cuts "run-out" duct costs!

- METAL-LINED AND COVERED
- MAXIMUM FLEXIBILITY
- EASY TO INSTALL
- FLAMEPROOF—WATERPROOF
- REDUCES VIBRATION —DEADENS NOISE
- EXCELLENT AIRFLOW CHARACTERISTICS



THERMAFLEX is easy to handle: it can be compressed longitudinally making it easy to install. It lends itself to abrupt changes in direction.

Specially designed for you —

THERMAFLEX A — is a three-ply, insulated, reinforced duct specially designed for use as a cost-saving flexible connector from main line ducts to sound boxes and diffusers in both high and low pressure air-conditioning and ventilation systems.

Because it is so easy to install and may be bent around interferences such as water pipes, structural cross connectors on vertical ceiling supports, THERMAFLEX eliminates the need to reposition sound boxes after installation . . . thus greatly cutting time and labor costs.

And, where good accoustical features are desired, THERMAFLEX B is ideal. It is a 2-ply reinforced, laminated air duct.

Send for this brochure

Fully illustrated — gives you all the time-saving, cost-cutting facts you need.

Thermaflex

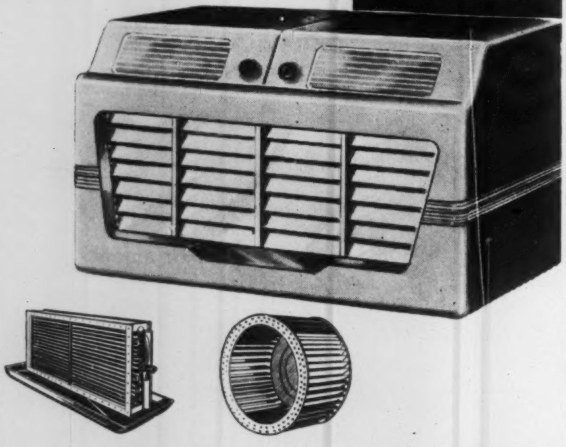
Flexible Tubing

CORPORATION

Guilford, Connecticut **Pasadena 1, California**

Better Yet,

USE FAIRMONT aluminum



In better parts and accessories for heating and cooling applications, Fairmont 2S, 3S and 52S wrought aluminum sheet is nationally recognized for highest quality and uniformity. Improved appearance, higher thermal conductivity, lighter weight, wear-resistant ductility, and non-corrosive and stain-proof surfaces—all these objectives and more are readily achieved.

Fairmont bright aluminum rolling mill products—sheet, coil and circles are now available for prompt delivery to meet manufacturing schedules.

FALCO
FAIRMONT
ALUMINUM COMPANY
•
Fairmont, West Virginia

RECENT TRADE LITERATURE..

Automatic Heating Controls

New 1954 catalog of automatic heating controls describes 395 different heating and cooling devices of which 137 have never been listed before. The air conditioning control section has also been expanded. In addition to product descriptions, the booklet gives technical information on all of the firm's heating and cooling control systems, valve capacities and thermostat heater setting data.

Manufacturer—Minneapolis-Honeywell Regulator Co., 2641 4th Ave., S., Minneapolis 8, Minn.

Centrifugal Blowdown Separators

Four-page folder describes the operation of a centrifugal blowdown separator. According to the manufacturer, boiler blowdown is jetted tangentially in the separator. A vortex is created which allows the steam to pass on through a top opening of approximately six times the area of the inlet jet. Water and sludge are carried into a chamber beneath the separator, then to the sewer through a pipe approximately four times the area of the inlet jet. Since pressure is released with the steam flash through the top opening, water flow to the sewer is by gravity.

The folder also contains a table of dimensions and specifications and several schematic installations.

Manufacturer—Wilson Engineering Corp., 122 S. Michigan Ave., Chicago 3.

Controlled Volume Pump

Bulletin 1153-A describes the design and operation of the "Hyroymetric" controlled volume pump, said by the manufacturer to be "the largest controlled volume pump ever built." A graph compares the new pressure and capacity ranges now available with the former.

Manufacturer—Milton Roy Co., Station L, 1300 E. Mermaid Lane, Philadelphia 18, Pa.

Dust Control in Asbestos Industries

How dust can be controlled in industries working with asbestos is discussed in Bulletin 412. The booklet has four case histories which show how "Dustube" cloth-tube type dust collectors are employed to ventilate various dust producing machines in these industries. Methods of product recovery are pointed out. Photographs show the type of hooding and duct work employed.

Manufacturer—American Wheelabrator & Equipment Corp., 1321 S. Brykit St., Mishawaka, Ind.

Factory-Assembled Steam Generators

Catalog SB-51 describes factory-assembled water tube steam generators. The booklet shows in detail production methods and materials employed in the fabrication and assembly of "Keystone" steam generators. Also included are characteristics and specifications of all materials furnished, including accessories.

Manufacturer—Erie City Iron Works, 1450 East Ave., Erie, Pa.

Fittings and Piping Handbook

New 304-page fittings catalog and piping handbook gives detailed dimensional data and specifica-

THERE'S A STAYNEW VENTILATION PANEL FILTER

FOR EVERY TYPE OF COMMERCIAL AND INDUSTRIAL SERVICE

Ventilation and air conditioning engineers recognize the Model WKE dry-panel filter as the most efficient unit of its kind on the market today. Wide range of media is available — it operates at maximum efficiency with any medium that comes in sheet form and can be crimped. Because of its extreme versatility, the Staynew WKE filter may be used for hundreds of varied applications.

- Greater filtering area, size for size, than competitive panels.
- Construction permits wide selection of filtering media.
- Wire screen cloth front and back of medium eliminates "sagging" and protects it so that even the most fragile materials can be cleaned over and over again.
- Can be cleaned quicker than any other type panel.
- Can be washed or dry cleaned when necessary.
- Medium can be replaced quicker than in any other panel.

Inexpensive disposable media can be furnished, if desired.

For complete information write today for Bulletin DPF-100.

Representatives in Principal Cities

MODEL WKE Dry Panel Filter Available in 2", 4", and 8" Deep Units

One exclusive advantage with the Staynew WKE is that it can be easily vacuum-cleaned in place. Saves time—reduces maintenance costs.

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PROTECTOMOTOR
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STAYNEW FILTERS

DOLLINGER CORPORATION
9 Centre Pk., Rochester 3, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

O.K. to Re-order

For Commercial, Industrial and Institutional Installations

Sizes 1 to 60 gph capacity. Only oil burner designed especially to burn No. 5 oil without preheating. Gas, combination gas/oil burners also available.

See the New No. 4 National Oil Heat Exposition Booth 851

Fuel savings up to 30% make HEV-E-OIL Burner *best buy* for you!

No wonder HEV-E-OIL Burner customers are *repeat* buyers! Hundreds of commercial and industrial buyers say HEV-E-OIL Burners helped them save up to 30% on fuel costs by *burning thrifty heavy oils.* Here's what typical owners* say:

> "— since installing your HEV-E-OIL burners, we have been using the No. 5 grade oil, this has saved us approximately $900.00."
>
> "— we formerly used 30,000 gallons of light oil per year. Now, with Cleaver-Brooks HEV-E-OIL Burners, we only consume 25,000 gallons of No. 5 oil, which gives us a saving of $700.00 per year."

*Names on request

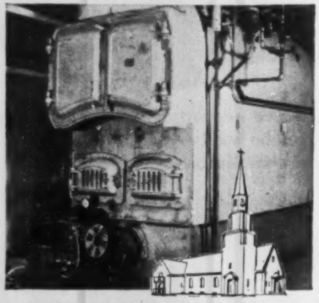
Here's how to get started cutting heating bills 30%

1 Add up your present heating bills — then deduct 30%. This is your approximate saving with HEV-E-OIL Burner.

2 Write for Bulletin AD-102—highly illustrated, with more fact-packed reasons why it will pay you to convert to HEV-E-OIL.

3 Get in touch with your Cleaver-Brooks HEV-E-OIL dealer — he will be glad to make a free survey without obligation.

REMEMBER . . . if you are using 6,000 gals of oil, or more than 45 tons of coal per year — the HEV-E-OIL Burner is the *best buy* for you! Write direct for name of dealer nearest you.



HEV-E-OIL Burner Installed at Bay Shore Lutheran Church, Milwaukee, Wis.

Cleaver-Brooks

BURNER DIVISION • CLEAVER-BROOKS COMPANY
Dept. D-380 E. Keefe Ave., Milwaukee 12, Wisconsin

RECENT TRADE LITERATURE . . .

[*Continued*]

tions on seamless welding pipe fittings, forged steel flanges, large diameter flanges and screwed and socket welding fittings. The catalog includes a 56 page data section featuring allowable stress and *P/S* tables, maximum allowable working pressure charts as well as tables of piping codes and standards.

Manufacturer—Ladish Co., 5300 S. Packard Ave., Cudahy, Wis.

Fittings, Tubing for Vacuum Systems

Complete specifications are given in a new folder on "Vacu-Flo" standard steel fittings and tubing for vacuum systems and conveying lines. Also described is a diverter valve used for transferring or switching various materials which have to be collected or conveyed through tubing or pipes.

Manufacturer—H-P Products, Inc., Broad St., Louisville, Ohio.

Fuel Oil Heaters

Bulletin 1415 describes two types of fuel oil heaters: the "Twin G-Fin Section" with longitudinally-finned heat transfer elements, and the "Type B" tubular heater; and explains the details of design and features of both types. Sectional views, illustrations of installations, specifications and dimension tables are included. Selection tables showing various capacities and pressures are given.

Manufacturer—The Griscom-Russell Co., Wetmore Ave., Massillon, Ohio.

Gas Pressure Regulators

Bulletin No. 2921-B describes the "Series 931" gas pressure regulators. These regulators are designed for use on heating equipment, water heaters, and similar applications. Regulators are suitable for manufactured, natural, LP and mixed gases.

Manufacturer—Penn Controls, Inc., Advertising Dept., P. O. Box 556, Goshen, Ind.

Greenhouse Temperature Control

A study of the latest applications of automatic temperature control systems to greenhouses has recently been published by a firm which makes, plans and installs such systems. A system is described in Bulletin M-14 whereby greenhouse temperatures are regulated in accordance with the outdoor light intensity. Other developments covered include automatic operation of roof ventilators for temperature and humidity control and the use of an astronomical clock to automatically change temperatures from day to night level.

Of special interest to heating contractors and engineers are the discussions of the unique temperature and humidity requirements of greenhouses and the control diagrams for typical greenhouse heating installations.

Manufacturer—Johnson Service Co., 507 E. Michigan St., Milwaukee 2, Wis.

Heat Exchanger and Condenser Tubing

Folder TB 329A lists the analyses and mechanical properties of 29 carbon, alloy and stainless

More Space and Comfort

—today's favorite "customer appeal"

INVISIBLE Panel Heating makes every inch of space usable . . . with comfort too!

It was a woman who first called it *"invisible"* heating . . . for *flexible* living.

With a woman's intuition she saw right to the heart of the matter. Here was the comfort of pleasant, natural, healthful heat *plus* absolutely no *visible* source of heat supply in the living area. No more spending a lifetime with the furniture always in one place! For radiant panel heating imparts that *flexibility* needed for modern living, the assurance of a fresh, redecorated look whenever desired. Simply by shifting the furnishings to new positions . . . because every inch of floor and wall space is unobstructed and *usable.*

No wonder radiant panel heat is increasingly popular. It satisfies a man's mechanical and technical requirements; it delights the homemaker's need for comfort with decorative flexibility.

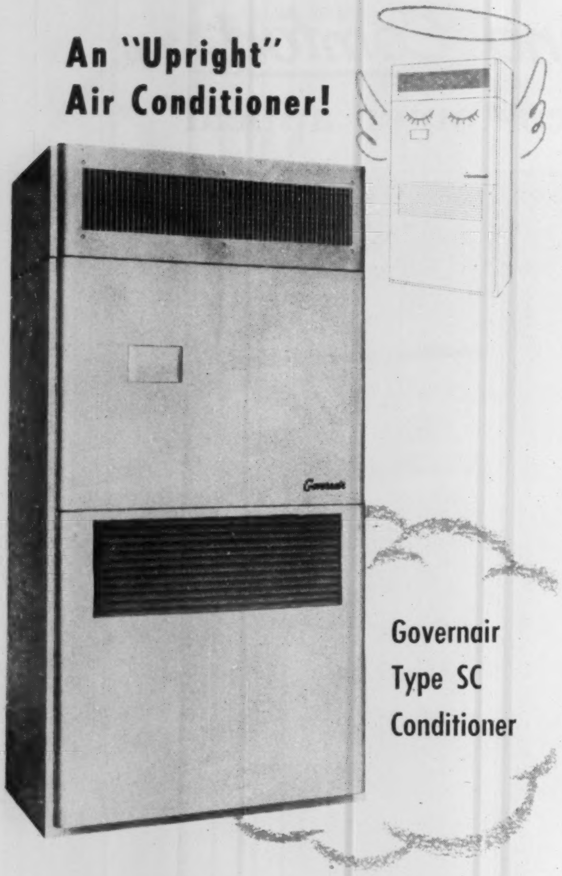
But though modes and methods of heating may change, the best medium of transmission for wet heat goes on forever . . . time tested *steel pipe.* For steel pipe has been *proved* in more than 60 years of conventional hot water and steam heating applications. It also has the qualities of economy, durability, weldability and formability required for a successful *invisible* heating system. In fact it is the most widely used pipe in the world for plumbing, heating, fire sprinkler systems, air, gas and water lines!

Write for the free 48 page color booklet, "Radiant Panel Heating with Steel Pipe."

Steel Pipe
is First Choice

COMMITTEE ON STEEL PIPE RESEARCH
AMERICAN IRON AND STEEL INSTITUTE
350 Fifth Avenue, New York 1, N.Y.

An "Upright" Air Conditioner!

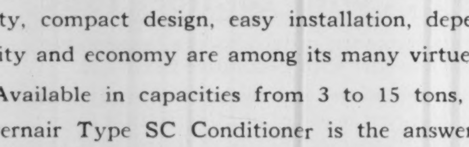


Governair Type SC Conditioner

Yes, this is an *upright* Governair self-contained conditioner—but that's not the reason for the halo.

The halo is there because this air conditioner behaves itself! Built to perform true air conditioning quietly and efficiently . . . it does just that! Flexibility, compact design, easy installation, dependability and economy are among its many virtues.

Available in capacities from 3 to 15 tons, the Governair Type SC Conditioner is the answer to your air conditioning needs in commerce, institutions, factories and homes. Choose *Governair* . . . originators* of completely packaged air conditioners!


AIR CONDITIONERS
COMPLETELY PACKAGED AIR CONDITIONERS
BLAST COILS FOR HEATING & COOLING
EVAPORATIVE CONDENSERS

GOVERNAIR

*Type SCU Conditioners Patent No. 2,297,928

GOVERNAIR CORPORATION • 513 N. Blackwelder • Oklahoma City Okla.

RECENT TRADE LITERATURE . . .

[*Continued*]

tubing steels used in various types of heat exchangers and condensers. Additional data presented in other tables includes reference specifications and application information.

Manufacturer—The Babcock & Wilcox Co., Tubular Products Div., Beaver Falls, Pa.

High Temperature Water Systems

Bulletin No. 100 discusses and illustrates the applications of high temperature, high pressure water in distributing heat to large area installations such as district heating, airports, hospitals, schools, shopping centers, housing projects and industrial building groups. Schematic diagrams are shown for various types of installations.

Manufacturer—American Hydrotherm Corp., 33-70 12th St., Long Island City 6, N.Y.

Indicating Temperature Transmitter

Catalog 1022 describes an indicating temperature transmitter which features a dial type thermometer and a pneumatic transmitter in a combined unit. The unit is illustrated and line illustrations show bulb and socket variations. Specifications, uses and materials of construction are given. One section of the bulletin shows a list of standard dials, illustrations of receiver types and a line drawing of the unit showing dimensions, panel cutout and various suggested installation methods.

Manufacturer—Penn Industrial Instrument Corp., 4110 Haverford Ave., Philadelphia 4.

Industrial Pumps, Compressors

Bulletin WP-1099-B61 contains information about special features, types, sizes and capacities of the company's various product lines of industrial equipment and describes the application of each of the lines in various industries. Some of the products illustrated and described are centrifugal and rotary pumps, condensers and coolers, various types of compressors, steam power plant equipment, etc.

Manufacturer—Worthington Corp., Advertising and Sales Promotion Dept., Harrison, N.J.

Lagging Adhesives and Coatings

Technical Bulletin 5307 (AIA File No. 37-D) describes "Adhez-A-Kote" lagging adhesives and coatings for shrinking, sizing, bonding and protecting insulation lagging fabrics. The publication outlines features of the product, pictures typical installations and provides an actual sample of treated lagging fabric. Complete data on proper application is included.

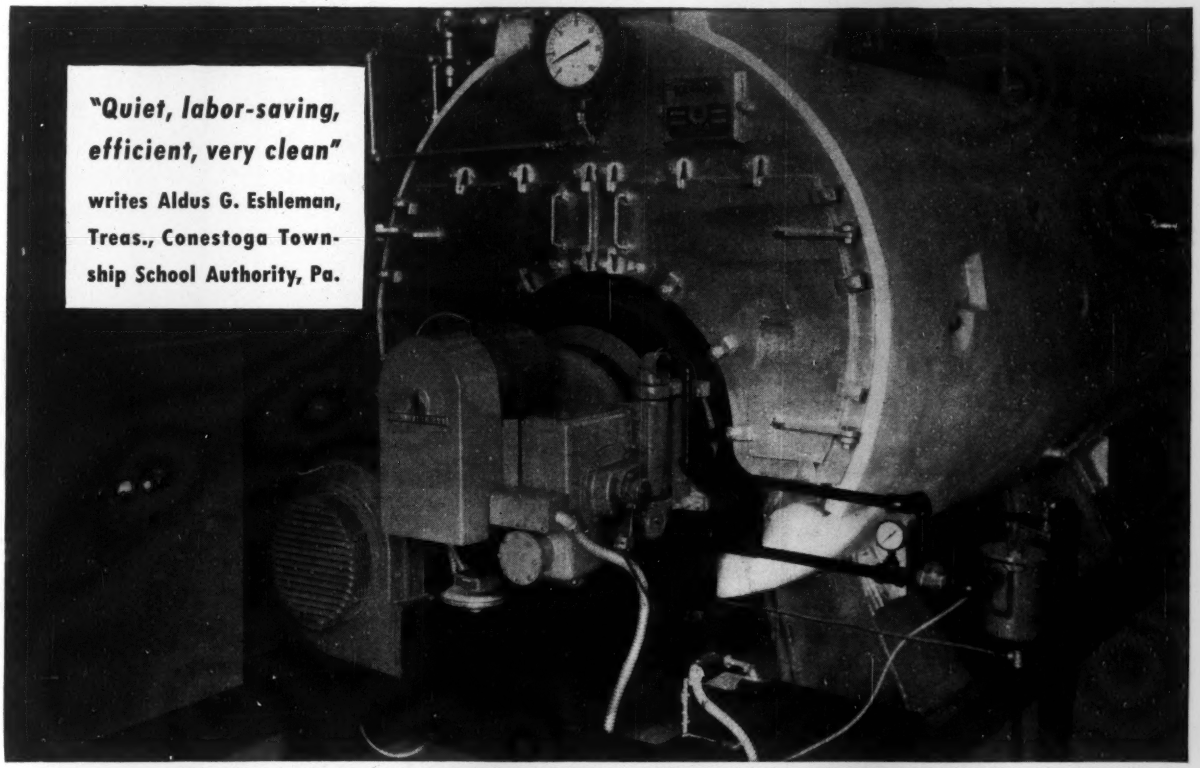
Manufacturer—General Paint Corp., 2627 Army St., San Francisco 19, Calif.

Light Weight Pipe

Bulletin No. 507 shows typical applications of the firm's light weight, lockseam, spiral weld pipe and fittings. Included are standard specifications on pipe from 4 in. to 30 in. in diameter, together with data on fabricated fittings, flanges and connections.

Manufacturer—Naylor Pipe Co., 1230 E. 92nd St., Chicago 19.

It's quiet says Pennsylvania school official



"Quiet, labor-saving, efficient, very clean"

writes Aldus G. Eshleman, Treas., Conestoga Township School Authority, Pa.

Architects, Buchart Engineering Corp., York; Consulting Engineer, William Hood, York; installation by Huss Heating & Appliance Co., Lancaster.

Iron Fireman forced draft industrial burner, for oil, gas and oil-gas combination

Quietness is desirable in any heating plant, but in schools and hospitals its importance overshadows many other considerations. Yet it is a quality that is noticeably absent in many automatic firing jobs. The sound level is something that Iron Fireman engineers have given the attention it deserves in these "packaged" burner units. They are quiet because of the way they are built, and because of the draft system they use.

"PACKAGED" MEANS READY TO INSTALL AS A UNIT

The entire unit is assembled and tested at the factory, ready to bolt to the boiler. It includes burner; wired and tested electrical control panel; oil heating system and/or gas control manifold; and built-in forced draft system with integral fuel and air controls. This means big savings in installation costs, plus the assurance of correct selection and assembly of component parts.

FOR SCOTCH MARINE OR OTHER TYPES OF BOILERS

The Conestoga School equipment shown above was sold as an integrated boiler-burner unit, complete except for service connections. The Scotch marine boiler was designed specifically for use with the Iron Fireman burner. The two units combined, form a factory engineered, balanced unit.

The Iron Fireman packaged unit is adaptable to practically all types of boilers, for either existing or new settings.

Send coupon for more information, or call your Iron Fireman dealer.

Iron Fireman

AUTOMATIC FIRING EQUIPMENT FOR OIL, GAS, COAL
HEATING, PROCESSING, POWER

THE IRON FIREMAN

IRON FIREMAN MANUFACTURING COMPANY
3068 West 106th Street, Cleveland 11, Ohio

Please send detailed information on Iron Fireman packaged burner units for oil, gas and oil-gas combination firing.

Name ....

Address ....

City .... *State* ....

SPRING SIZE No 8
BLAW-KNOX CO.
POWER PIPING DIVISION
BLAW-KNOX
PIPE HANGERS
SUPPORTS
VIBRATION ELIMINATORS

complete hanger assemblies save your engineering time

For complete information, write for your copy of Bulletin No. 54.

You can save many hours of engineering time and speed up your specifications by using Blaw-Knox overhead roller assemblies, rigid hanger assemblies, functional spring hangers with the patented *internal swivel action*, and vibration eliminators.

Each is a complete unit designed for a specific purpose. Constructed to comply with the "code for pressure piping" requirements. Available in types and sizes to meet varying conditions.

And each is ready to install. So you also eliminate expensive cutting, threading and assembling in the field.

Any time you'd like some help, our experienced engineers are available to both design and make recommendations for your hanger requirements.

BLAW-KNOX COMPANY Power Piping and Sprinkler Div., Pittsburgh 33, Pa.

BLAW-KNOX

PIPE HANGERS

Complete line of functional spring hangers • rigid hanger assemblies • overhead roller assemblies • supports • vibration eliminators . . . plus complete prefabricated power piping systems

RECENT TRADE LITERATURE . . .

[Continued]

New NEMA Standard Electric Motors

Form 1676 presents six tables giving dimensions and specifications of the company's new motors conforming to the new NEMA standards for electric motors. Comparisons between the old and new motors are shown.

Manufacturer—Century Electric Co., 1806 Pine St., St. Louis 3, Mo.

Packaged Air Conditioners

Bulletin No. 77-5 provides construction details, complete specifications and performance ratings of the 1954 line of packaged air conditioners. The new units have been designed with three sectional components which can be arranged in 15 different combinations to permit air intake and discharge at the front, side, rear or top. For year 'round operation, a heating coil can be added.

Manufacturer—United States Air Conditioning Corp., 3300 Como Ave., S.E., Minneapolis 14, Minn.

Packaged Boilers for Schools

Four-page folder describes "Powermaster" packaged automatic boilers for steam process as well as steam and hot water heating service as applied to schools. Constructional and operational advantages are given and typical installations are shown. The firing equipment for light and heavy oils as well as gas is described.

Manufacturer—Orr & Sembower, Inc., Morgantown Rd., Reading, Pa.

Packaged Steam Generator

Bulletin BE 3 on the manufacturer's automatic boiler describes this unit's design—a two-pass system with forced draft. Air enters through turbine-like vanes to create a spinning or highly turbulent flame in the furnace. Gases are spun again in all return tubes by means of a fixed steel impeller. A large cutaway diagram points out all features of the boiler.

Manufacturer—Continental Boiler Div., Boiler Engineering & Supply Co., Inc., Phoenixville, Pa.

Power Drives and Pipe Machines

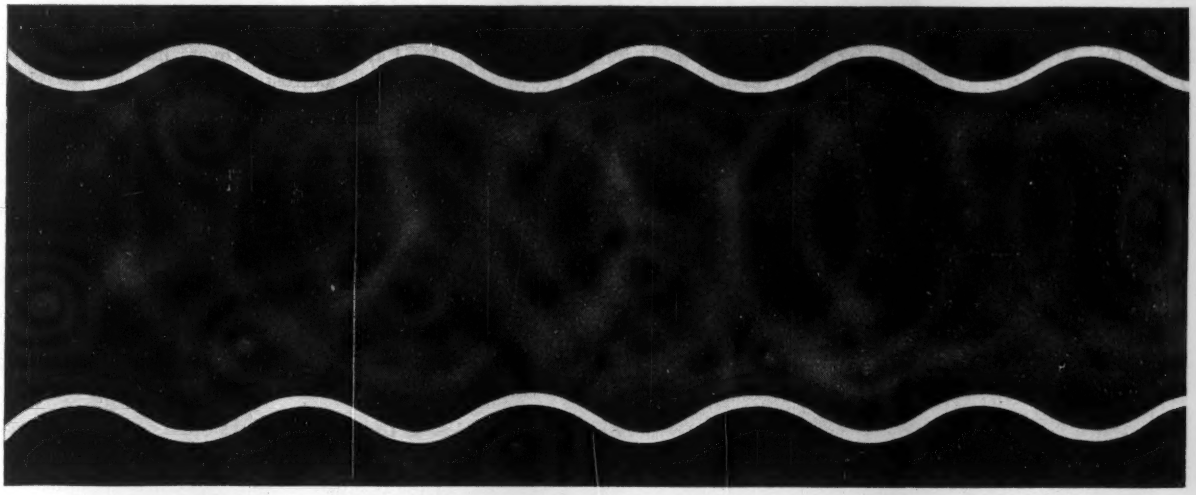
Reference catalog covers dimensions, operating capacities, ordering specifications, dies available and accessories for five pipe machines and power drives, plus the company's new "55" universal nipple chuck. Several models of pipe and belt machines and portable power drives are fully described and shown in color. Several line drawings show various adaptations and features of the equipment.

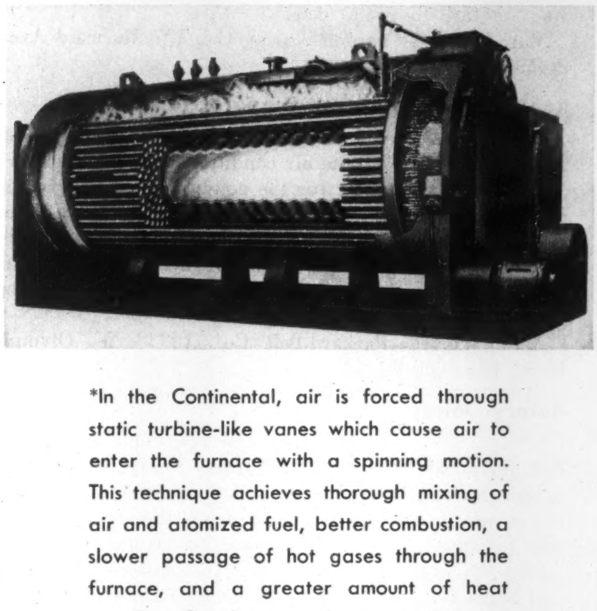
Manufacturer—Beaver Pipe Tools, Inc., Dana Ave., Warren, Ohio.

Pumps for Air Conditioning

A new 96 page catalog, C-54, gives comprehensive data, construction details, and selection tables for 12 types of water systems including dual-purpose jet pumps and submersible deep well pumps. Miscellaneous units featured include the new "Motor-Mount" centrifugal

Introducing *Continental's* Spinning Gas Technique*





*In the Continental, air is forced through static turbine-like vanes which cause air to enter the furnace with a spinning motion. This technique achieves thorough mixing of air and atomized fuel, better combustion, a slower passage of hot gases through the furnace, and a greater amount of heat transfer. On the second pass, gases are spun again by means of a stationary impeller in each 3'' return tube. So much heat is transferred by the two-pass design and spinning gas technique that an independent engineering firm found operating efficiency of the unit under test to be 84.23%... with steam quality at 99.43%.

Through use of the spinning gas technique the Continental Automatic Boiler achieves full combustion and over 80% efficiency by means of a two-pass design ... Due to this technique and design the Continental costs little to maintain, gives long service life, and results in fuel costs equal to, if not lower than most other type packaged units.

Owners report that they can open a Continental for cleaning or inspection in less than a half hour—due to the hinged doors on both ends. Another owner reports fuel savings of 25%—the result of Continental's spinning gas technique and improved design.

For full details on the many exclusive features and advantages of the Continental Automatic Boiler—units from 20 to 500 hp; 15 to 200 lbs. W.P.—write for new Bulletin BE3.

CONTINENTAL BOILER DIVISION
BOILER ENGINEERING & SUPPLY COMPANY, INC.
Phoenixville, Pennsylvania

40 YEARS OF BOILER MANUFACTURING EXPERIENCE

CONTINENTAL is sold, installed and serviced by competent distributors throughout the U.S.

Cut customer fuel bills 7 days a week

it's good business to always install a PARAGON 700 Series Calendar Time Switch on commercial heating units

YES, the good word gets around fast when a Paragon 700 Series Time Switch is on the job cutting heating bills. Heat is *automatically turned off* when not needed. Customer satisfaction through lower fuel bills *plus* fewer service "call backs" are big profit boosters for you! Check these features: :

- **COMPLETELY FLEXIBLE** — completely economical. Switch settings can be made for the entire week's schedule, yet easily and quickly changed. ON-OFF or OFF-ON operation can be as close as 3 hours.
- **FULLY AUTOMATIC** — set it, then forget it. Saves money weekends, for example: switch may be set to cut off heat Saturday noon, then automatically start regular heating cycle earlier than usual Monday.
- **INSTANTLY CHANGEABLE** — simply set the dial trippers at desired day or night hours. Total of 14 are supplied as standard equipment.

Ask for Bulletin HP-5407

See your jobber, or write:

Dial is graduated in hours and half-hours Night and day periods clearly separated. Available in 24, 120 and 240 volts; 25, 50 and 60 cycles. No complicated wiring. Lists as low as $27.50.

PARAGON ELECTRIC COMPANY
TWO RIVERS, WISCONSIN
World's Foremost Manufacturer of Time Controls

RECENT TRADE LITERATURE . . .

[Continued]

pump designed primarily for air conditioning service.

Manufacturer—The Deming Co., 14 Aetna St., Salem, Ohio.

Refrigeration Products

Catalog CD 53 covers line of unit coolers, valves, automatic defrost systems, coils, ice cube makers and coil and pan combinations. The bulletin contains 31 tables giving dimensions, performance data and complete engineering specifications for each product. One section tells how to figure refrigeration loads for cooler installations and gives sample calculations. Several charts list information on heat leak factors, service factors, heat of occupancy, areas and volumes of walk-in coolers, load factors for glass areas of refrigerators, product storage data, relative humidity and temperature-pressure conditions.

Manufacturer—Tenney Engineering Inc., 26 Avenue B, Newark 5, N.J.

Remote Liquid Level Indicators

Bulletin WG-1824 contains a complete description of the company's remote liquid level indicator. Applications and recommendations are listed and wiring diagrams are shown in detail.

Manufacturer—Yarnall-Waring Co., 107 Mermaid Ave., Philadelphia 18.

Room Conditioners and Evaporative Coolers

A series of charts gives information on the firm's "Bellair" room air conditioners and evaporative coolers. A sizing chart for the conditioners shows which model to pick by referring to the room area and window area. Another chart gives specifications on all models, while a third one gives dimensions by means of a schematic diagram. A fourth chart covers specifications for evaporative coolers.

Manufacturer—Packard-Bell Co., 12333 W. Olympic Blvd., Los Angeles 64.

Rotary Joints

Construction and operation of the new ball and socket type "Phillips" rotary joints are described in this bulletin. Designed to permit transfer of liquid or steam into or out of a revolving drum, the socket is available in either the "Thru-Flo" style, for drums having two outlets; or in the syphon style for installations where inlet and outlet is desired in the same unit, or for syphon drainage of condensate from the steam chambers of a roll or drum.

Distributor—Key Co., 27th and McCasland Ave., East St. Louis, Ill.

Rubber Seal

Booklet describes the newly patented "Quad Ring," a four-lipped rubber seal designed to resist spiral twist. Included are applications, engineering features and characteristics of the ring, showing cross section drawings under various pressures. Also shown are cross sections of a typical installation and complete listing of all sizes, dash numbers and tolerance variables.

*FIRST LINE *Extended-Surface* HEAT EXCHANGERS

ASK THE AEROFIN MAN

Specify Aerofin and you specify high efficiency, long service life and low maintenance and service costs.

Take advantage of Aerofin's unequalled experience, production facilities, and materials-testing and design research—of Aerofin's complete engineering service at the plant and in the field.

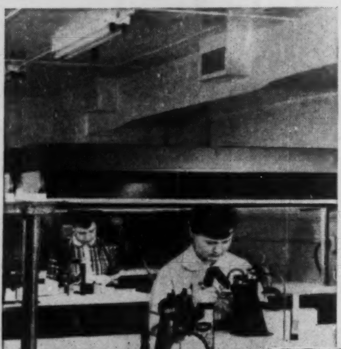
Ask the Aerofin man.

* Aerofin makes extended heat surface exclusively — not as a by-product, not as a side-line. Sold only by manufacturers of fan-system apparatus. List on request.

AEROFIN CORPORATION
410 South Geddes St., Syracuse 1, N. Y.

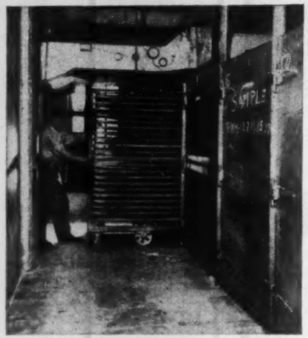
You can have **DRY AIR**
with exact moisture control..

FOR
YOUR COMFORT
FOR
YOUR PROCESS
FOR
TESTING MACHINES
OR MATERIALS AT
ANY TIME OF
THE YEAR



Assembling Electronic Parts

Packaging Food Products



Drying Industrial Material

● This Niagara "Controlled Humidity" method gives you the **MOST EFFECTIVE** Air Conditioning because its cooling and heating functions are made completely separate from adding or taking away moisture. This assures you always a precise result. No moisture sensitive instruments are needed.

MOST FLEXIBLE. You can reach and hold any condition in response to instrument settings, or vary it as you wish.

EASIEST TO TAKE CARE OF. The machine is accessible, the control circuits are simple and easy to operate, and there are no solids, salts or solutions to be handled.

MOST COMPACT. It does a very large amount of work in a small space.

INEXPENSIVE TO OPERATE. At normal atmospheric temperatures (unlike systems that use refrigeration to dehumidify) it needs no summer re-heat.

Write for Bulletins 112 and 122

NIAGARA BLOWER COMPANY

Dept. HP, 405 Lexington Ave. New York 17, N. Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

RECENT TRADE LITERATURE . . .

[Continued]

Manufacturer—Minnesota Rubber and Gasket Co., Dept. KP, 3630 Wooddale Ave., Minneapolis 36, Minn.

Silicone Rubber Products

New literature describes the injection molding of silicone rubber products. Included are the properties and applications of the material and suitabilities of the material regarding specific types of products.

Manufacturer—Minnesota Rubber and Gasket Co., 5724 W. 36th St., Minneapolis 16.

Steam and Liquid Control Equipment

Catalog No. 54 contains dimensions, specifications and cutaway photographs of the company's line of steam and liquid control equipment. Some of the equipment described includes pressure regulators, piston control valves, temperature regulators and controls, water pressure regulators, solenoid valves, diaphragm regulating valves, float valves, fluid level controllers and strainers.

Manufacturer—O. C. Keckley Co., 400 W. Madison St., Chicago 6.

Steam Hose Applications

The company's complete line of steam hose and their uses are described in this four-page bulletin. Cross section and cutaway photographs show the various types of construction. Included also are performance data, sizes, weights and working pressures. Information on the different kinds of couplings best suited for specific uses is also included.

Manufacturer—Quaker Rubber Corp., Div. of H. K. Porter Co., Inc., Tacony and Comly Sts., Philadelphia 24.

Training for Welders

Pictorial booklet describes the curriculum and organization of the Hobart Trade School. Courses offered include arc welding, carbon arc welding, hard facing, tool welding, stud welding, submerged arc welding, oxy-acetylene welding and cutting, and pipe welding.

Copies of the booklet may be obtained by writing the Registrar, Hobart Trade School, Troy, Ohio.

Tubes for Double Corrosion Service

Bulletin No. 1954 explains the use of "Duplex" tubes for heat exchangers and condensers in industries and process plants handling corrosive liquids, gases, refrigerants and circulating waters. According to the manufacturer, double corrosion simultaneously attacking the inside and outside of tubes can be retarded when the inner and outer walls of the tubes are made of two different metals. The bulletin lists the handling of products in various industries together with corresponding components of metals in the double wall tubing.

Requests for the bulletin should be addressed on company letterhead.

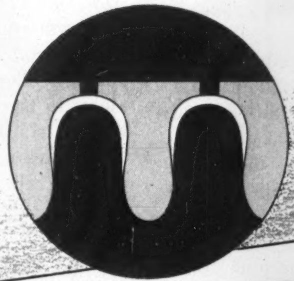
Manufacturer—Bridgeport Brass Co., 30 Grand St., Bridgeport 2, Conn.

Badger
Expansion Joints

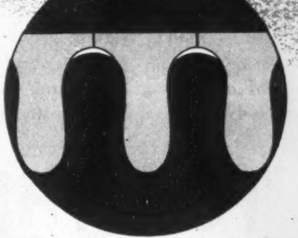
Typifying
Joint Engineering
at its Best

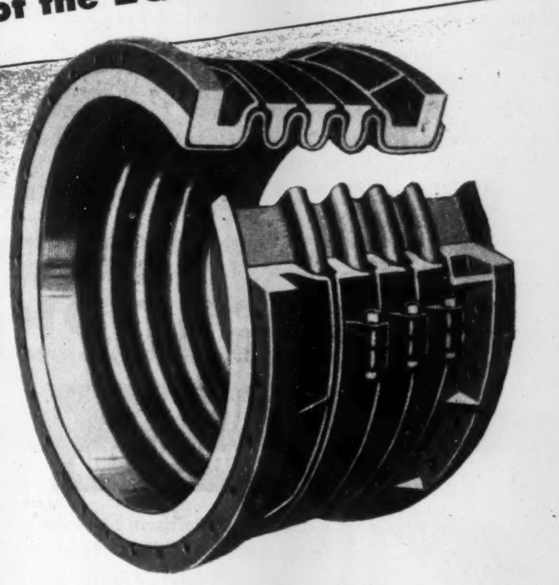
THE CALCULATED CURVE of the EQUALIZING RING

STARTING POSITION
LINE COLD



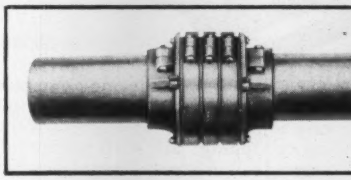
FINAL POSITION
FULL TEMPERATURE





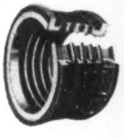
In the Badger Self-Equalizing Expansion Joint, the solid ring between the adjoining corrugations is more than a mere stop or block. It performs a directing as well as a limiting function. It's part of the Directed Flexing control because its specially calculated curved surface causes the all-curve corrugation to wrap itself around the ring. This distributes the flexing evenly over all parts of the corrugations.

Any design of equalizing ring with shoulders will act as a stop to limit the traverse per corrugation but it takes a special calculated curved surface to distribute the flexing properly. The long service life of the Badger Joint is due in large measure to the fact that all-curve rings aid in directing the flexing and in distributing the traverse as well as limiting the movement exacted from each corrugation.



●

Badger Expansion Joints come in a variety of types and a wide range of sizes: Directed Flexing, Self-Equalizing for normal and long traverses and higher pressures; Non-Equalizing, for short traverse or low pressures. Tandem Joints for combination axial and lateral movements; Clevis-Hinged Joints for angular movements; Special Vibration Control Joints; Flexible Pipe Line Seals for watertight connection between pipes and flood walls.



BADGER MANUFACTURING COMPANY

Original and Sole Manufacturer of Badger Expansion Joints

230 BENT STREET • CAMBRIDGE • MASS.

WE HEAR THAT . . .

HAROLD P. MUELLER, president of the *L. J. MUELLER FURNACE CO.*, and *HOBART C. RAMSEY*, president of the *WORTHINGTON CORP.*, have announced jointly an agreement for the transfer of the net assets, name and good will of the Mueller company to Worthington in exchange for Worthington common stock. Mr. Ramsey stated that the Mueller plant and facilities would be operated as the Mueller Climatrol Div. of Worthington, and that the entire Mueller working force and management will be continued. The line of "Climatrol" products will continue to be manufactured in Milwaukee.

BELL & GOSSETT CO.'s net profit after taxes increased 11 percent to $728,825 on record sales of $15,296,380, an increase of 15 percent, for the fiscal year ended November 30, according to the company's annual report to stockholders. Profit the previous fiscal year amounted to $655,888 on sales of $13,295,857.

Estimating a sales volume in excess of $20,000,00 for the current fiscal year, *E. J. GOSSETT*, chairman, stated, "Housing construction, which affects our hot water specialties line directly, is again expected to continue in large volume. The demand for air conditioning is expanding rapidly and should increase the sales of our heat transfer and centrifugal pump lines.

"The combination of these encouraging factors, we believe, will make 1954 a banner year, by all standards of comparison, in the history of our company," he told stockholders.

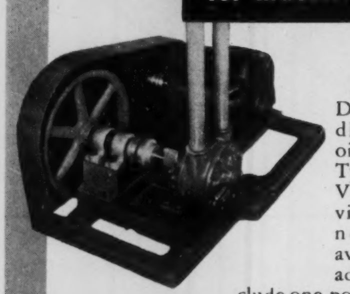
Robert I. Hicks, president of *LAMSON CORP.*, has announced formation of a new department which will specialize in the manufacture of mechanical accessories necessary for the control and operation of atomic energy power plants. *ROSS ATKINSON*, who was formerly shop superintendent, will head this department. *KARL C. SCHMEDICKE* will replace Mr. Atkinson as shop superintendent.

A motion picture titled "New Welding Procedures" has been produced by the *EUTECTIC WELDING ALLOYS CORP.* The film, in color and with sound, shows step by step welding rod and electrode techniques and procedures. The latest developments in torch and metallic arc welding are shown in typical operations. Also shown is a rock and concrete piercing electrode.

The *INSTITUTE OF ENVIRONMENTAL EQUIPMENT MANUFACTURERS* is offering a new 24-page brochure outlining its activities, membership classifications, contents of publications, and rules of its science contest. Copies may be obtained from Dr. George D. Wilkinson, general manager, Institute of Environmental Equipment Manufacturers, 30 Church St., New York 7.

THE RIGHT PUMP FOR THE JOB

TUTHILL TYPE SU
for Industrial Heating



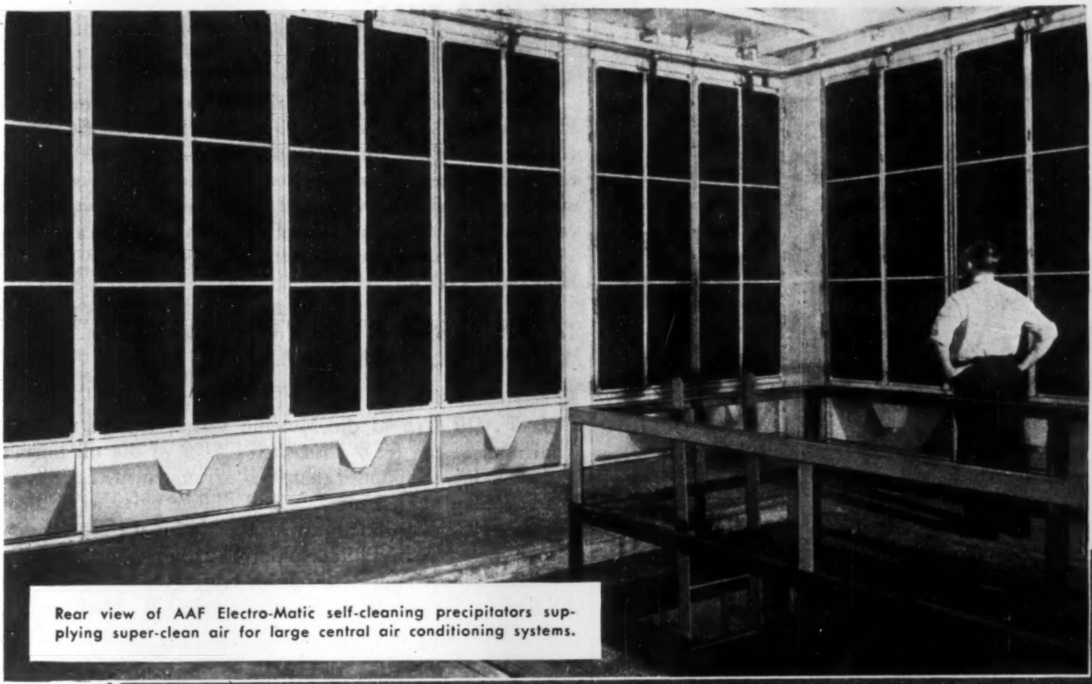
Designed to handle heavy fuel oils, the Tuthill Type SU multiple V-belt unit provides flexibility never before available. Typical advancements include one-point belt-tension adjustment; motors up to 5 h.p. mounted for easy adjustment or replacement without drilling or tapping; jack shaft supported by ball-bearing pillow blocks, carries weight of pulley and absorbs belt tension. For the complete story, write for Catalog No. 107.

TUTHILL 30A5G FUELSTAT
for Domestic Burners

For original equipment or replacement, Model 30A5G FUELSTAT offers many important advantages beyond traditional Tuthill quiet operation, leakfree performance and low power consumption. It is reversible in the field. It has a one-position vertical valve that can be piped from either side and serviced easily. Its mechanical seal is replaceable in the field. It is universally interchangeable with standard commercial models. It reduces pump inventory because the same pump can be used for both rotations and both valve positions. Write for Model 30A5G bulletin.

TUTHILL
PUMPS FOR THE PURPOSE

TUTHILL PUMP COMPANY
Dependable Pumps since 1927
939 East 95th Street, Chicago 19, Illinois
Canadian Affiliate: Ingersoll Machine & Tool Co., Ltd.
Ingersoll, Ontario, Canada



Rear view of AAF Electro-Matic self-cleaning precipitators supplying super-clean air for large central air conditioning systems.

Dust and Smoke Giving You a "Dirty" Deal?

If so, the AAF Electro-Matic is most likely the solution. This high efficiency electronic precipitator collects smoke with the same ease as larger air-borne materials. Its automatic, self-cleaning action permits continuous operation at peak efficiency. There are no costly shutdowns for washing and re-oiling of collector plates. When Electro-Matics "take over", super-clean air in constant, uniform volume is assured *automatically.*

Super-clean air is a basic commodity used by many businesses to assure cleanliness, protect quality and provide comfort. Discoloration of textiles; soiling of merchandise; costly building maintenance; contamination of pharmaceuticals; presence of stale tobacco smoke in hotels and restaurants—all were problems stemming from dust, soot and smoke. All were solved with the installation of AAF Electro-Matic precipitators as part of the air conditioning system.

Their cost? Mere pennies compared to the dollars they saved. For complete information on Electro-Matic precipitators, call your local AAF representative or write direct for Bulletin No. 250.

American Air Filter
COMPANY, INC.
373 Central Avenue, Louisville 8, Kentucky • American Air Filter of Canada, Ltd., Montreal, P. Q.

AAF

Shed those design shackles, specify

AGITAIR

You can give free rein to your creative planning and still rely on AGITAIR square and rectangular diffusers to provide draftless air distribution from any location. Custom-designed, with built-in diffusing vanes, in a wide variety of louvered patterns, they provide blows in 1, 2, 3 or 4 directions without use of blank-offs. AGITAIR diffusers need not be centrally located in an area if such placing does not agree with the decorative motif, or if a beam or other obstruction is in the way.

Moreover, AGITAIR square and rectangular diffusers are now available with or without removable, interchangeable cores. AGITAIR also brings you Stripline, the slender, continuous air diffuser with unlimited application versatility.

New 34-page Type R Catalog reveals how correct air distribution is simplified by AGITAIR. Contact your local AGITAIR representative, or write us direct for your free copy.

AIR DEVICES INC.
185 Madison Avenue, New York 16, N. Y.

AIR DIFFUSERS • FILTERS • EXHAUSTERS

WE HEAR THAT . . .

[Continued]

The Department of Industrial Medicine of New York University's Post-Graduate Medical School is offering a course in air pollution beginning on May 10. The course has been designed to acquaint industrial hygienists, stationary engineers, chemical and power plant engineers, etc., with the fundamentals of the measurement and prevention of atmospheric pollution. The sessions will be held daily for two weeks.

Application should be made through the Office of the Dean, New York University Post-Graduate Medical School, 477 First Ave., New York 16. Tuition is $60.

J. W. OWENS of the Mercoid Corp., who is national chairman of the *OLD TIMERS' CLUB* of the oil burner industry, has announced that final arrangements have been made for an annual meeting and dinner party to be held on May 18, in conjunction with the National Indoor Comfort Exposition in Philadelphia. Further information is available from Stanley Czarnecki, Eddington Specialty Co., Eddington, Pa., or H. A. Maccubbin, 120 W. Madison St., Villa Park, Ill.

GOLDEN-ANDERSON VALVE SPECIALTY CO. of Pittsburgh has moved its general offices to new and larger quarters at 1232 Ridge Ave. The engineering staff has been doubled and production facilities modernized and enlarged.

A new 16 mm color motion picture with sound, entitled "Whatever We Do," has recently been produced by *AIR REDUCTION SALES CO.* It is a basic documentary film about atmospheric gases — oxygen, nitrogen, argon, helium, etc. — covering their uses in industry and daily living. Detailed animation shows how gases in pure form are separated individually from the air. Information on using the film may be had by writing to the Air Reduction Sales Co., 60 E. 42nd St., New York 17, or by contacting any district office.

Ground has been broken for a new 237,000 sq ft plant in Long Beach, Calif., to house the Grayson Controls Div. of the *ROBERTSHAW-FULTON CONTROLS CO.* To be built at a cost of approximately $2½ million, the new plant will employ about 2400 people. Two factory areas are planned, with an adjoining office area that will be completely air conditioned.

Funds to cover a four-year scholarship for an air conditioning and commercial refrigeration degree have been presented to California State Polytechnic College by *DRAYER-HANSON, INC.* The college is planning to solicit high schools to find the most promising student for the scholarship.

PITTSBURGH PLATE GLASS CO. has agreed to purchase the fiber glass manufacturing facilities and other

WE HEAR THAT . . .

[*Continued*]

assets of the *GLASFLOSS DIV.* of Tilo Roofing Co., Inc. Assets include the manufacturing plant at Hicksville, Long Island, N. Y., machinery and other equipment, inventories on hand, patent rights, trademarks and good will.

Erection and occupancy of a new building to house its engineering department has recently been completed by *AMERICAN ENGINEERING CO.* in Philadelphia. The building is said to be one of the largest of its type and is completely modern.

At the recent second annual printing week graphic arts exhibit, held in Philadelphia, the *Betz Handbook of Industrial Water Conditioning* was awarded the "best of the year" citation as the best designed and printed publication in its class during 1953.

EDWARD F. MANEELY, president of the *WHEATLAND TUBE CO.*, has announced its plant expansion program is rapidly progressing. Upon completion, an additional 40,000 sq ft of operating space will have been cleared and new shipping and manufacturing facilities installed.

The *NATIONAL CYLINDER GAS CO.* soon will begin construction in Chicago of a $3½ million plant for manufacturing and distributing liquid oxygen. *CHARLES J. HAINES*, president of the company, said the growth of business in the area makes the added production to be obtained from the new plant essential to meet the demand. A new oxygen plant recently began operations at Tampa, Fla.

The *RELIANCE ELECTRIC and ENGINEERING CO.* has placed contracts for a new plant addition to its division at Ashtabula, Ohio. The building will be a single story, 90,000 sq ft structure duplicating the manufacturing capacity of the Ashtabula plant completed in 1947. Both plants will be served by a common locker room and cafeteria.

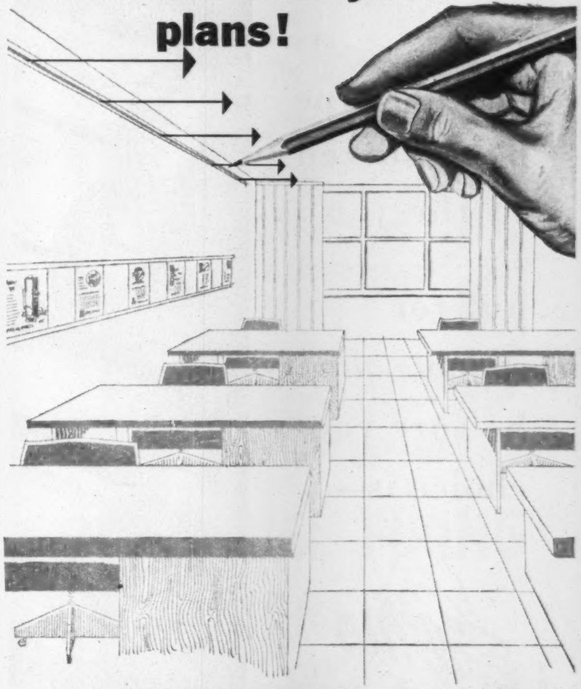
Office employees of the *NATIONAL RADIATOR CO.* are attending classes in the NRC College of Heating Knowledge. The course, designed to better acquaint employees with company policies, products and their applications, began early in March and was scheduled to continue until mid-April. In cooperation with the sales and research personnel, weekly lectures provide a general, nontechnical course.

MARS ENGINEERING, INC., Newark, N.J. has added a new division which will design industrial dust collection and fume elimination systems, according to *ALBERT C. TESS*, president. Until now the company has specialized exclusively in the design and manufacture of machinery.

See how inconspicuously

STRIPLINE

fits into your plans!



Unlimited air distribution provided by slender continuous diffusers ...another AGITAIR first!

Stripline diffusers offer complete application versatility. They are ideal for installation in shallow lighting coves...window stools for air curtaining of glass windows or exposed wall areas...side of furred beams... or as a decorative border blanketing the entire area with noiseless, draftless air distribution. Custom built with AGITAIR's patented diffusing vanes, Stripline diffusers create maximum mixing and aspiration... quick temperature equalization and correct air distribution over any desired length.

Write for your free copy of Catalog S-100 today.

AGITAIR STRIPLINE

AIR DEVICES INC.
185 Madison Avenue, New York 16, N. Y.
AIR DIFFUSERS • FILTERS • EXHAUSTERS

Choose your
PIPE COVERINGS
with care...

...pick the type
best suited
to the job ...

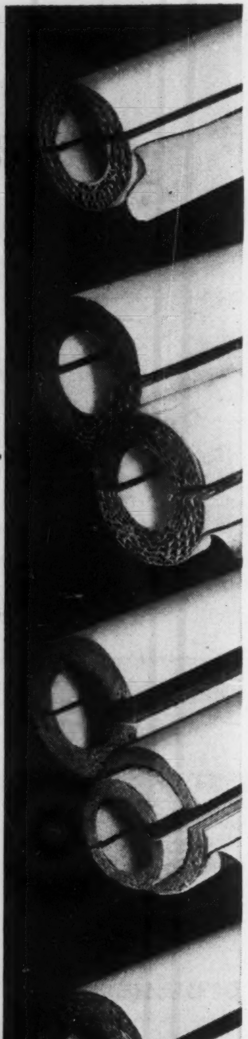
...but for
dependable quality,
be sure your
choice is—

Sal-Mo

Known as the BEST in AsBESTos for over 65 years.

Generous sample, put up in attractive carton, free on request. In ordering, please specify type of covering in which you are interested.

SALL MOUNTAIN CO.
HAMILTON, OHIO



WHO'S WHAT . . .

The appointment of *L. D. MANDELL* as general sales manager has been announced by *KRITZER RADIANT COILS, INC.* Mr. Mandell formerly was vice president of C. A. Dunham Co.

CHESTER S. STACKPOLE has been appointed general sales manager of the *UNION ASBESTOS and RUBBER CO's* Heating and Cooling Div. He will be in complete charge of sales and marketing of the company's new heating and cooling products and will maintain his headquarters in Chicago.

At the annual meeting of the *HEATING and COOLING COIL MANUFACTURERS ASSOCIATION* held in Chicago recently, the following officers were elected for the ensuing year: *P. G. KAYSER*, president; *W. C. JONES*, vice president; and *G. W. McCORMICK, JR.*, secretary-treasurer.

Mr. Kayser is with McQuay, Inc. and Mr. Jones is with Westinghouse.

E. L. BARNETT is the new works manager for the *BINKS MFG. CO.* and will supervise the manufacturing division. Before going to Binks he was senior engineer for A. T. Kearney & Co., management consultants.

New officers for 1954 of the *INDUSTRIAL UNIT HEATER ASSOCIATION* are: *I. W. CLARK*, president; *W. G. SCHLICHTING*, vice president; and *G. W. McCORMICK, JR.*, secretary-treasurer.

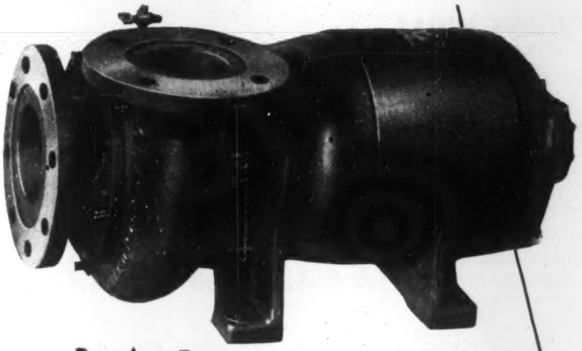
Mr. Clark is manager of the Heating and Ventilating Dept. of the American Air Filter Co. Mr. Schlichting is sales manager of the Heating, Cooling and Air Conditioning Div. of the Young Radiator Co.

WILLIAM B. F. DREW, secretary-treasurer of J. L. Murphy, Inc., has been elected president of the *BUILDING TRADES EMPLOYERS' ASSOCIATION.* New vice president is *JOSEPH A. COURTER*, president of Courter & Co.

GEORGE R. WACHTER has been named vice president and general sales manager of *FREEZING EQUIPMENT SALES, INC.* He has been manager of sales engineering during the past five years and has been with the corporation since 1935.

WALLACE J. HOEING has been appointed sales manager of the air conditioning division at *SERVEL, INC.*, according to an announcement by H. R. Neilsen, manager of the division. The position which Mr. Hoeing now fills was made vacant by Mr. Neilsen's recent promotion to manager.

Mr. Hoeing joined Servel's air conditioning division as a salesman in 1943. In 1946, he became senior ap-



WEINMAN

Close

Coupled

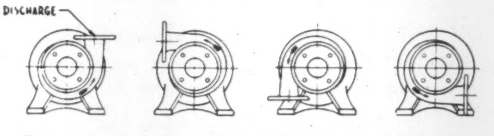
Centrifugal

Pumps

lower in first cost, lower in maintenance cost!

Installation of air conditioning systems is sometimes a tricky business. Space in existing buildings is usually limited, making pump replacement a real problem. WEINMAN close coupled centrifugal pumps are designed to lick this problem, and here's the way they do it:

WEINMAN pumps require less space to begin with. They can be mounted in any position. Note, too, that the discharge can be turned to any one of four different positions.



This means you can mount a WEINMAN pump on the wall, suspend it from the ceiling, bottom or side of a tank, or on the floor . . . important where installation space is limited.

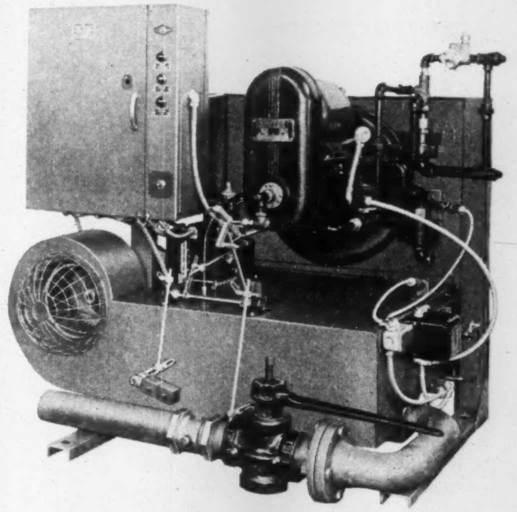
If pumps are a problem that's plaguing your installations, call a WEINMAN Centrifugal Pump Specialist. He has the solution and the pumps, to solve the toughest jobs.

"Centrifugal Specialists"

The WEINMAN Pump Mfg. Co.

296 Spruce St. Columbus 8, Ohio

WEBSTER ROTONETIC*



DUAL FUEL FIRING BURNER

- √ **Sizes from 75 to 300 horsepower.**
- √ **Minimum gas pressure requirements.**
- √ **Low installation costs.**
- √ **Maximum efficiencies on BOTH gas and oil.**
- √ **Minimum base height requirements.**
- √ **Utilizes all grades of fuel oil.**
- √ **Extremely low noise level.**
- √ **Approved electronic combustion safeguard system.**
- √ **Simpler changeover than ever before.**
- √ **One hundred per cent forced draft.**
- √ **Completely assembled, piped, wired and tested.**

These and many other outstanding features combine to provide the same dependable high quality performance as the WEBSTER DYNETIC gas burner. Neither fuel must suffer if the WEBSTER ROTONETIC is used. With integral pumps, integral oil preheaters for heavy oils, patented oil burner "flame-shaping" vanes, and full modulating or optional high-low control, the WEBSTER ROTONETIC is designed to provide long lasting customer satisfaction the year around.

It is furnished with a precast refractory front as an integral part of the burner assembly. The installer need only finish the furnace wall on each side and above the burner.

Listed by Underwriters' Laboratories, Inc.

TRADEMARK** ***Write for Literature

The WEBSTER ENGINEERING COMPANY

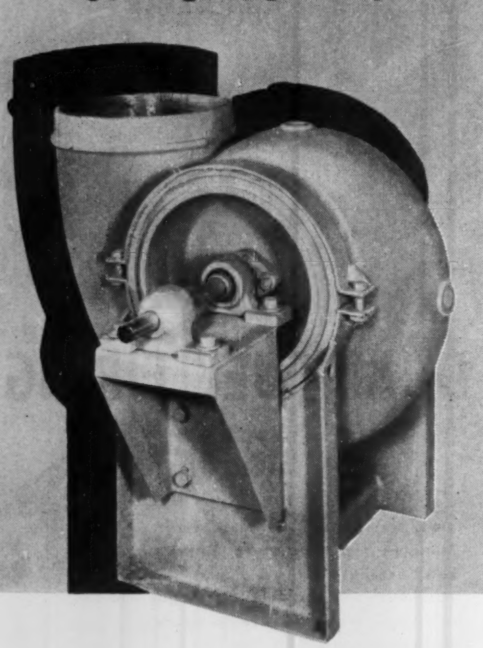
TULSA, OKLAHOMA

Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

For acid fumes

newly designed for less weight and improved performance *

DURCO exhaust fans



* New Durco B-series fans give unexcelled corrosion resistance. Duriron casing with a Durimet 20 multi-blade rotor resist corrosion throughout entire metal thickness.

These fans are lighter, more efficient and less expensive than any previous Durco fans. They are for use wherever corrosive fumes exist—hospitals, schools, laboratories and plants.

THE DURIRON COMPANY, INC.
DEPT. HP, DAYTON, OHIO

DURCO
CORROSION RESISTING ALLOYS & EQUIPMENT

Please send Bulletin on B-series Durco Fans.

Name__________
Company__________
Address__________
City__________
State__________

WHO'S WHAT . . .

[*Continued*]

plication engineer on the factory staff. For the past three years he has been regional air conditioning manager in the eastern region, with headquarters in New York.

The company has also announced the appointment of *G. HOWARD CHRISTINE* as product manager of the room air conditioner division. Mr. Christine, who has been contract sales manager at Servel for the past year, will continue to serve in that capacity temporarily.

Shareholders of *BELL & GOSSETT CO.* elected two new directors, increasing the board from five to seven members. New directors are *A. S. MARLOW, JR.*, and *W. A. BOONE*, both executives in the company's sales department. At a board of directors meeting, Mr. Marlow was elected a vice president of the company.

The company has also announced the appointment of *FRANK GALL* as sales promotion manager. In his new duties Mr. Gall will handle the educational program and will be headmaster at the "Little Red Schoolhouse," teaching the latest in heating and cooling design.

A. B. DRASTRUP has been elected by the board of directors as executive vice president of the *A. M. BYERS CO.* Mr. Drastrup, who has been with the firm since 1931, has been assistant to the president for the past three years. The elections of *J. F. BYERS, JR.* and *B. M. BYERS* as vice presidents of the company also have been announced by the board.

ORA E. JOHNSONBAUGH has been appointed service engineer for *PENN CONTROLS, INC.* He replaces *K. W. FISHER*, who was recently appointed district manager for the Dallas territory.

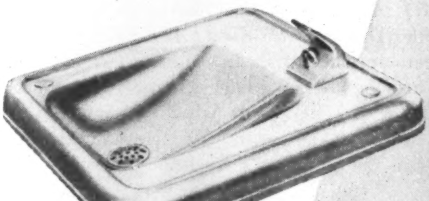
HARRY C. BALLMAN has been appointed executive secretary of the *AIR POLLUTION CONTROL ASSOCIATION*. In this position, Mr. Ballman is the senior incumbent of the Air Purification Fellowship maintained at the Mellon Institute by the association.

MATTHEW J. FITZGERALD, president of the *STANDARD ASBESTOS MFG. CO.*, has been elected vice chairman of the board of lay trustees of DePaul University in Chicago. He succeeds the Democratic national chairman, Stephen A. Mitchell.

C. L. KENNY now is manager of products for *QUAKER RUBBER CORP.*, Div. of H. K. Porter Co., Inc. In his new position, Mr. Kenny will coordinate the activities of the factory with those of the sales force.

Appointment of *THOMAS H. BRUMAGIN* as chief engineer of the *AJAX FLEXIBLE COUPLING CO., INC.* has been announced by President William T. Welch.

Temprite



WITH THE

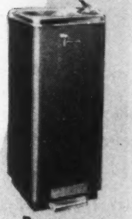
DEEP

STAINLESS STEEL

TOP

EVERYTHING about the beautiful Temprite Water Cooler is generous, substantial, sturdy! The sanitary stainless steel top is *extra deep* . . . the anti-splash guard *extra full* . . . The flow of cool water won't splash, won't spurt, won't find its way on to the surrounding floor!

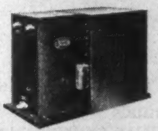
Dismantle the Temprite, if you wish; look inside and you will see the fully corrosion resistant cooling system, the *extra strong* all-welded steel frame, and *heavy gauge* sheet steel cabinet panels. Built for years of service. The compressor is hermetically sealed and lubricated for life. Everything about the Temprite line spells *EXTRA* QUALITY!



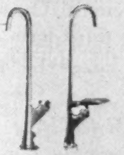
Pressure Bubbler Coolers in Nine Models.

Bottle Coolers in standard or compartment type.

Bubbler type compartment coolers



Remote type coolers in three sizes.



Temprite accessories include wall fountains, glass fillers, transformers, optional push-button control assembly, etc.

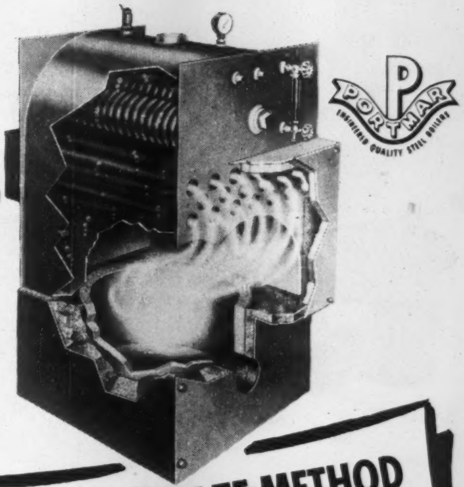
Since 1929

Temprite

PRODUCTS CORPORATION

P.O. BOX 72-L
EAST MAPLE RD.
BIRMINGHAM
MICH.

PORTMAR
ENGINEERED QUALITY STEEL BOILERS



MOST UP-TO-DATE METHOD OF SATISFYING VOLUME HOT WATER REQUIREMENTS

in... apartment houses, restaurants, hotels, hospitals, office buildings, schools, factories, processing plants, etc.

WH SERIES
Oil or Gas Fired

9 Sizes—350,000 to 1,650,000 BTU/hr.
Hot Water Delivery: 300 to 5,000 G.P.H.

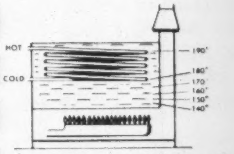
A.S.M.E. APPROVED

PORTMAR Twin Coil Volume Water Heater Eliminates the Storage Tank!

★***Instantaneously and automatically delivers large quantities of sanitary hot water through copper coils.***

Here's a clean, compact, low-cost installation that operates with exceptional economy . . . reduces high maintenance, utilizes valuable space. The heater's fast hot water circulation makes the unit self-cleaning, causes quick temperature pickup, needs no recovery time. Supplies two temperature hot water: 140° for general use; 180° for sterilizer-rinse.

ADVANTAGES OF THE INDIRECT (TANKLESS) HOT WATER SYSTEM

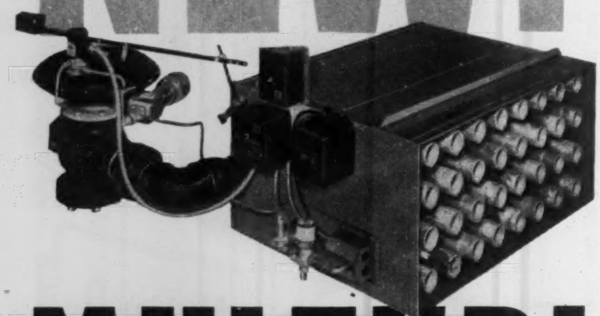


Protected by free-circulation water, the submerged twin coils never come in contact with intense burner heat, which of course, shortens the life of direct systems. In indirect systems, the coils are the highest point in the water heater circuit. The hottest water rises as it is heated, transferring heat to the twin coils. Water flowing through the coils is instantly heated for immediate use.

Write for literature and prices

Portmar Boiler Company Inc.
193 Seventh Street, Brooklyn 15, N. Y.
Residential, Commercial, Industrial Water Heaters and Heating Boilers, Vertical, Horizontal Tubular Boilers • Rotary Flame Boilers

NEW!



MULTURI

(Multiple Venturi)

GAS BURNER

Especially designed for . . .

HARD-TO-FIRE
● SCOTCH MARINE BOILERS
HARD-TO-FIRE
● STEEL FIRE BOX BOILERS

AT HIGH FIRING RATES AT HIGH EFFICIENCY!

A Premix Type Gas Burner, ideal for commercial and industrial size boilers and warm air furnaces. Gives maximum performance from hard-to-fire Scotch Marine and steel fire box boilers. Flame characteristics make the burner a natural for units with extensive refractory surface. Suitable for any gas at 4″ gas pressure or more. Permits high firing rates at high efficiency. Simple to install, adjust, and operate. Completely Factory Wired and Assembled . . .
Ready for Immediate Installation !

MULTURI BURNERS are available in standard modular units of 6 to 54 mixers. Capacities from 1,200,000 to 10,800,000 BTU/hr. Special units of higher capacities can be furnished. *Write or phone us for detailed information.*

Also Available — Nordensson Power Burners and Combination Gas-Oil Burners.

INDUSTRIAL GAS EQUIPMENT DIVISION
CODE OF ETHICS SIGNER
GAS APPLIANCE MANUFACTURERS ASSOCIATION
SIGNER NO. 32

ROBERTS-GORDON APPLIANCE CORP.
DEPARTMENT HPAC • BUFFALO 6, N. Y.
Conversion Gas Burners • Gas Heating Equipment

WHO'S WHAT . . .

[*Continued*]

Mr. Brumagin has been associated with Ajax in the engineering department for seven years.

JAMES M. ADAIR has been appointed sales manager of the Electric Motor Div. of the *HOOVER CO.* In his new capacity, Mr. Adair will supervise sales of the entire line of fractional and integral horsepower motors.

Promotion of *J. A. HALLINAN* to assistant sales manager, Pacific Boiler Div. of *UNITED STATES RADIATOR CORP.*, has been announced. In addition to his new duties, he will also act in an advisory capacity with the company's Chicago Heights plant which is engaged in defense work. For many years Mr. Hallinan served in key positions in the company's Cyclotherm Div.

ROBERT S. RICKABAUGH, sales manager, Wet Heat Div., Tuttle & Bailey, Inc., is the new president of the *CONVECTOR MANUFACTURERS ASSOCIATION*, succeeding *RAY O. REEVES* of Airtherm Mfg. Co. Mr. Reeves was named vice president for the coming year and *GEORGE W. McCORMICK, JR.* was re-elected secretary-treasurer.

A. S. KROMER has been named general manager of the Calumet Div. of *CALUMET & HECLA, INC.* with headquarters at Calumet, Mich. Mr. Kromer had been manager of the company's Wolverine Tube Div. plant in Decatur, Ala.

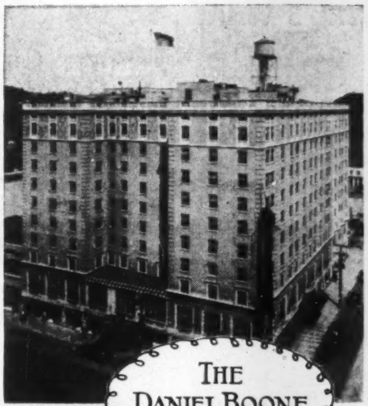
New officers for 1954-55 were elected at the tenth annual *NATIONAL ASSOCIATION OF CORROSION ENGINEERS* conference at Kansas City in mid-March. President of the group is *AARON WACHTER* of the Shell Development Co. *F. L. WHITNEY, JR.*, of Monsanto Chemical Co. was elected vice president. Re-elected for his third term as treasurer was *RUSSELL A. BRANNON* of the Humble Pipe Line Co.

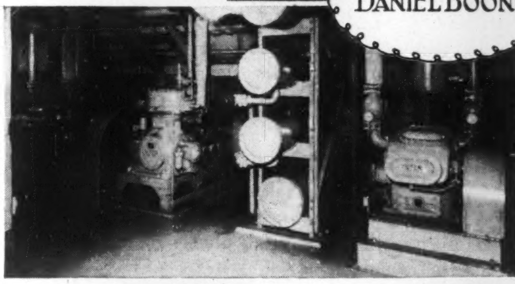
MARTIN J. HARTIGAN has been appointed manager of supply purchases of *JOSEPH T. RYERSON & CO., INC.*

J. A. ZURN MFG. CO. has announced the appointments of *ALBERT A. BAKER* as executive assistant and *JOHN L. DERBY* as plant manager. Mr. Baker formerly was plant superintendent and Mr. Derby was associated with the Blaw Knox Co.

MAURICE J. WILSON, sales engineer in the Atlanta district office of *CARRIER CORP.*, will join the Syracuse home office as a product specialist on conduit "Weathermaster" systems. Mr. Wilson joined Carrier 23 years ago as a control engineer.

Looking for real satisfaction in REFRIGERATION ?





✓CHECK with VILTER

The Daniel Boone Hotel of Charleston, West Virginia, knows how good Vilter refrigeration is. In 1947, the Daniel Boone switched to Vilter and bought a Vilter twin cylinder vertical freon compressor.

In 1950, The Daniel Boone added a Vilter VMC eight-cylinder compressor.

In 1953, they have added their third Vilter unit, another Vilter VMC eight-cylinder compressor.

In the process, the Daniel Boone has remodeled their equipment room to provide space for two more Vilter compressors, which they expect to purchase as replacement for other units.

It's pretty obvious that the Vilter equipment has cost less to maintain, has given less trouble, and that Vilter has followed through as usual with interest in the job that becomes greater, not less, after the sale has been made.

Vilter refrigeration and air conditioning can do as much for you. Better check Vilter!

Installed by **Commercial Refrigeration, Inc., Huntington, W. Va.**

Vilter®

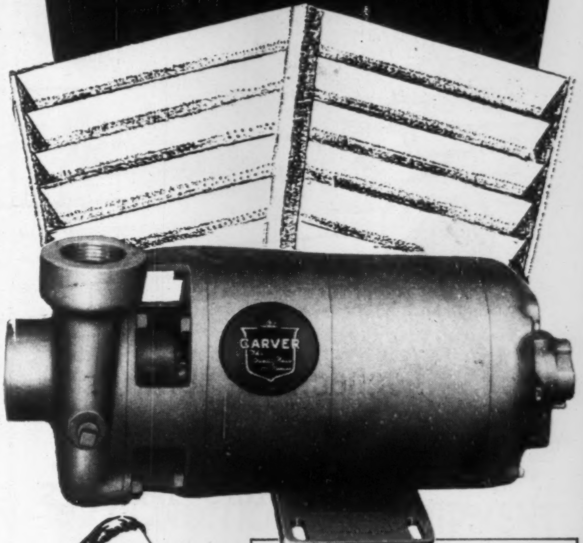
Your nearby Vilter Representative or Distributor will be glad to show you why so many Vilter users re-order Vilter every time.

REFRIGERATION and AIR CONDITIONING

THE VILTER MANUFACTURING COMPANY
MILWAUKEE 7, WISCONSIN

Air Conditioning • Ammonia & Freon Compressors • Booster Compressors • Baudelot Coolers • Double Pipe Coolers • Blast Freezers • Evaporative & Shell & Tube Condensers • Pakicers • Pipe Coils • Valves & Fittings

You Buy
DEPENDABILITY
When You Buy
CARVER



Model B ELECTROPUMPS
Capacities up to 70 G.P.M.
Heads up to 110 Feet.
1" and 1¼" Discharge

Don't take a chance on being shut down for service calls when the weather man says "Hot and Uncomfortable Today."

Specify CARVER AIR CONDITIONING ELECTROPUMPS . . . make sure you get thoroughly dependable pumping at all times . . . keep your air conditioning system at top efficiency every day of the year.

With CARVER you have the greatest little pump in the industry. Soundly engineered, it's a combination of pump and motor that leads the field in quality, performance and appearance.

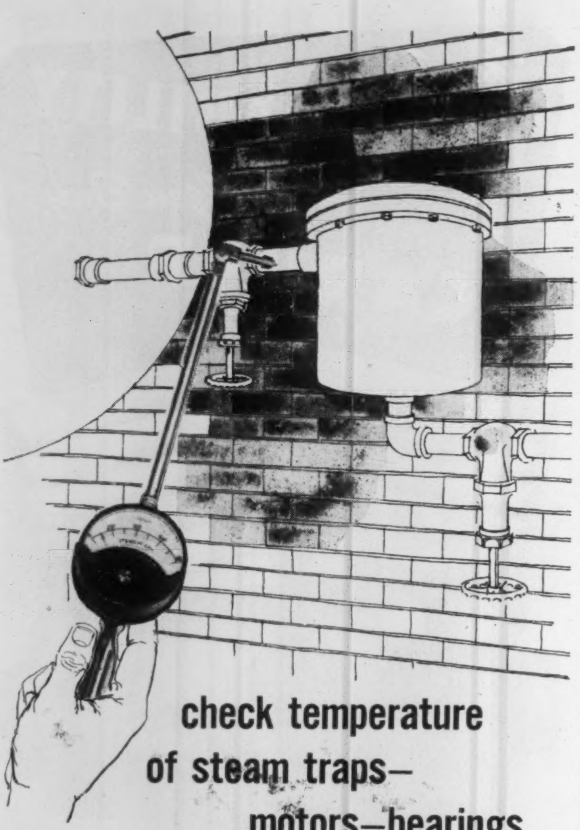
CARVER *has the answer to your pumping problems.* Capacities up to 4200 G.P.M. Pressures up to 135 pounds. Give us the conditions we'll give you the answer.

Ask for Bulletin No. 211

CARVER PUMP COMPANY 1460 Hershey Avenue
MUSCATINE, IOWA

CARVER *The Quality Name in Pumps*

CARVER PUMPS



check temperature of steam traps—motors—bearings

. . . quickly and accurately with the Alnor Pyrocon, the portable contact pyrometer for taking surface temperatures. This handy, portable instrument can be your most useful maintenance and installation tool . . . it provides accurate temperature readings instantly of any surface (metallic or non-metallic), flat, curved, stationary or revolving.

It's a well-balanced instrument mounted in a sturdy case for protection against the usual hazards of on-the-job service. Jeweled movement is also heavy-duty, shock-resistant type that will withstand hard and continuous use . . . performing with laboratory accuracy.

A wide selection of thermocouples and extension arms assures its adaptation to your needs. Eight standard F. scale ranges are available up to 1200°F. Send for complete details contained in Bulletin 4257. Illinois Testing Laboratories, Inc., Rm. 513, 420 N. LaSalle St., Chicago 10, Ill.

Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

WHO'S WHAT . . .

[*Continued*]

WILBUR S. HOLTON, assistant general sales manager of the *ORANGEBURG MFG. CO., INC.* has been elected vice president. Mr. Holton joined Orangeburg in 1929.

The *BURNHAM CORP.*, Boiler Div., has announced the appointment of *E. T. SELIG, JR.*, as director of engineering. Before joining Burnham, Mr. Selig was manager of the Product Engineering Dept. of the Richmond Radiator Co.

JOHN LACKMAN has been named executive technical director of the *CHESTER CABLE CORP.* Mr. Lackman had been in the technical department of the Du Pont Company and is known for his specialized work with nylon and polyethylene.

The *HAMMEL-DAHL CO.* has announced the promotion of *DAVID GOLNER* to sales manager. He joined the firm in 1945 as a development engineer and since that time has been affiliated with all phases of manufacturing, sales and management.

RHEEM MFG. CO. has appointed *THOMAS A. KELLY*, formerly manager of the company's Philadelphia plant, to the newly created post of manager of manufacturing planning with offices at the firm's Richmond, Calif., corporate headquarters. The new manufacturing planning department has been established to coordinate a variety of engineering and production activities throughout the 13 U. S. plants and 12 foreign plants.

Two recent appointments announced by *WORTHINGTON CORP.* are those of *ROBERT HUGHES* as air conditioning and refrigeration distributor supervisor at the Holyoke works and *CHARLES V. BENGLE* as manager of the Applied Systems Section in Air Conditioning and Refrigeration at the Harrison works.

John Norris, president of the *LENNOX FURNACE CO.*, has announced the promotion and appointment of *R. D. STRICKLER* to director of sales for all Lennox furnace plants and Norris Industries throughout the U. S. and Canada. Mr. Strickler has served as sales manger of the Lennox-Columbus plant since 1945. *C. B. LYTTON*, formerly division manager, will succeed Mr. Strickler as sales manager in Columbus. Succeeding Mr. Lytton as division manager is *F. T. LOCEY*. *ALLEN GEORGENSON* has been named assistant sales manager in Columbus to succeed Mr. Locey.

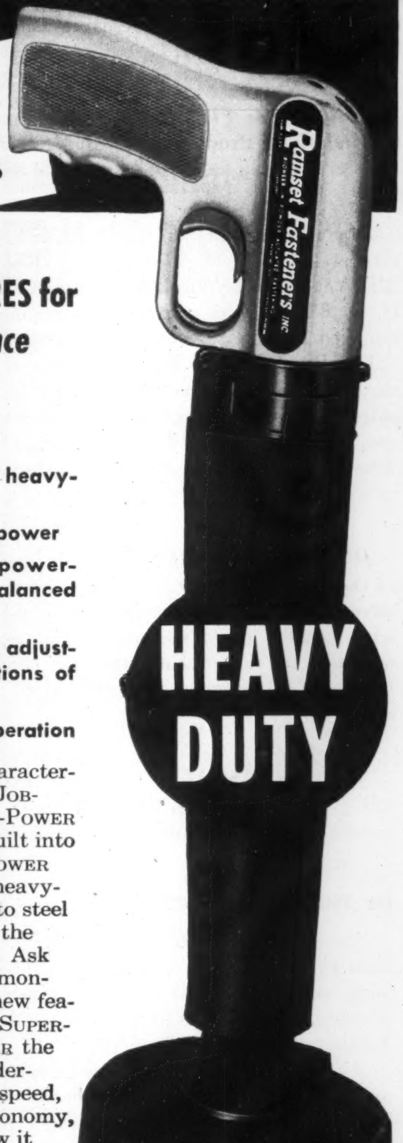
KSM PRODUCTS, INC. has named *H. L. WAGENER* as special consultant to its technical research group to guide in developing new materials and processes in stud welding. Pending completion of the new laboratory building, Mr. Wagener is designing tools that will aid in the research program.

NEW! Ramset

FASTENING SYSTEM

SUPER-POWER JOBMASTER

DESIGNED ESPECIALLY FOR PLUMBING CONTRACTORS



NEW FEATURES for
Performance
Economy
Utility

Shortest, lightest heavy-duty tool

Greatest driving power

New series of power-sealed charges balanced to the tool

Circle-Set Shield, adjustable for 12 positions of handle

Faster, easier operation

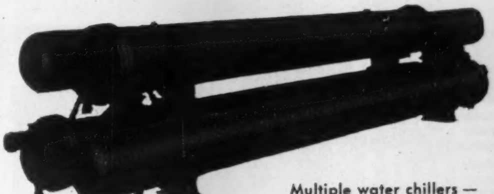
All the family characteristics of RAMSET JOBMASTER and PLUS-POWER JOBMASTER are built into the new SUPER-POWER JOBMASTER for heavy-duty fastening into steel up to 1″ thick or the hardest concrete. Ask your dealer to demonstrate the many new features which make SUPER-POWER JOBMASTER the outstanding powder-actuated tool for speed, ease, utility and economy, and show you how it takes over where all others leave off. Or, write us for details.

Ramset Fasteners Inc.
Ramset Division, Olin Industries, Inc.
12109 BEREA RD. • CLEVELAND 11, OHIO

FIRST IN POWDER ACTUATED FASTENING

AN Olin PRODUCT

Whitlock Type R Chiller (U-tube construction).



Multiple water chillers — Freon circuits in parallel, water circuits in series.

Whitlock Finned-tube Freon condenser.

AIR CONDITIONING EQUIPMENT
by
WHITLOCK

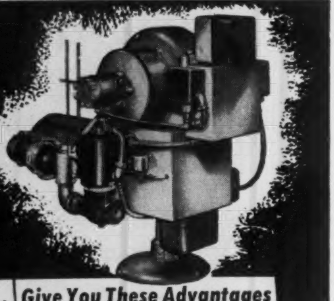
It pays to consult Whitlock on condensers, chillers, pipe coils, coolers, and receivers — for every air conditioning service. Standard sizes are available whether the job involves a load of a few tons or several hundred tons — whether it involves air conditioning a skyscraper, an apartment building, a movie theater, or any other commercial or industrial project. Let us know your needs. Send details for data and recommendations — or write for Bulletin 140 describing the complete line of Whitlock Air Conditioning Equipment. **The Whitlock Manufacturing Company**, 44 South Street, Hartford 10, Conn. In Canada: Darling Brothers, Limited, Montreal.

Now! A DUAL FUEL BURNER
Engineered To Insure Peak Efficiency With Both Fuels

GAS and OIL

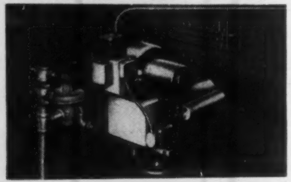
Siemon Power Combi-Matic Burner
employs the forced-draft principle
for firing on both gas and oil.

SIEMON
Bonus Built* Burners
offer more to you . . more to your customers.



*Bonus Built Features . . .	Give You These Advantages
Factory Assembled	Less installation time required.
Factory Tested—for Both Gas and Oil	Insures top "on the job" performance.
Automatic Air Adjustment	Just set it . . . forget it . . .
Motorized Gas Valve	Quiet start-ups; actuates air dampers to correct position.
Automatic Ignition Transformer	Automatic ignition for BOTH fuels.
Uses Standard Controls	Parts always accessible immediately.
Electronic safeguard	Immediate response to flame interruption.
Pressure Safety Control	Prevents opening of either fuel valve unless fan is running and pump pressure proven.
Optional Automatic or Manual Changeover	Will switch automatically from outside temperature or by the flip of a switch.

Model FGO-2200-E
Boiler fired at 2,000,000 B.T.U. input—gas and oil installation in a large Midwestern paper distributing plant



Siemon
Power Combi-Matic
DUAL FUEL BURNERS

Siemon Manufacturing Co.
1819 Holmes, Dept. A Kansas City, Mo.
Please rush literature and "profit plan" details about your Forced Draft Dual Fuel Burner.

Name__________
Company__________
Address__________
City__________ Zone_____ State_____

WHO'S WHAT . . .

[*Continued*]

S. C. ROTHMANN has been appointed director of Philadelphia's Div. of Air Pollution Control. Mr. Rothmann had been industrial hygiene engineer for the University of California where he was responsible for the engineering control of atmospheric contaminants for the four southern campuses, research centers and field stations of the university.

DONALD A. FITZROY has been named manager of the Industrial Products Div. of *METAL GOODS CORP.* He was formerly assistant manager of the division.

The appointments of *C. L. PETERSON* as divisional vice president of the *BROWN INSTRUMENTS DIV.* of *MINNEAPOLIS-HONEYWELL REGULATOR CO.* and *O. B. WILSON* as general sales manager have been announced by H. F. Dever, president of the division.

Mr. Peterson, who had been general sales manager of the division, will devote the major part of his time to sales policy matters and long range planning. Mr. Wilson, industrial sales manager since 1953, will assume active administration of the entire divisional sales department.

JULIAN F. WARREN, formerly merchandise manager of the *COLEMAN CO., INC.*, has been named director of advertising and sales promotion. *LELAND C. GINN*, who recently joined the company as assistant to the sales manager of the heating and air conditioning division, has been advanced to the position of merchandise manager.

S. K. HOSTETTER, JR., sales manager of *ELLIOT CO.'s* Crocker-Wheeler Div. for the past year, has been named general manager of the division.

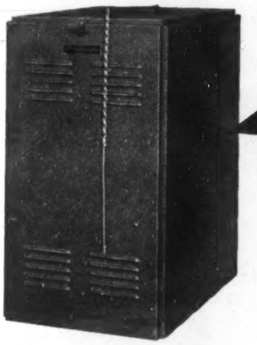
IN THE TERRITORIES . . .

For *RHEEM MFG. CO.*—*CARLOS H. HORNE* has been promoted from northern California regional manager to assistant general manager of the company's western division. He will continue to make his headquarters in Richmond (near San Francisco).

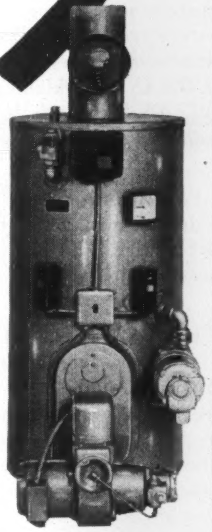
ANDREW W. HUGHES now is eastern region manager and is in charge of all of Rheem's manufacturing and marketing activities on the eastern seaboard.

For *GENERAL DYNAMICS CORP.*, Electro Dynamic Motor Generator Div.—*HARRY W. ELLIS* is midwestern regional manager.

For *WESTINGHOUSE ELECTRIC CORP.*—The *ENTERPRISE HEATING and AIR CONDITIONING CORP.* of Richmond, Va., has been awarded a franchise as distributor for field assembled air conditioning equipment. The firm serves Richmond and its surrounding counties.



Enclosed find the Famous ALDRICH Boiler-Burner



• Always ahead in efficiency and economy, now the Gulf Stream is up to the minute in style, too. Choice of 5 sizes, with net ratings of 66,000 to 168,000 BTU per hour. Home owners have a choice—the space-saving "package" or standard model, with all controls and accessories easily accessible, or the Gulf Stream completely enclosed in a streamlined housing.

Ruggedly and simply built, the Gulf Stream picks up the heating load with immediate response. Special multiple-flue tube construction affords maximum heat extraction and quick transfer of heat to the boiler water.

With the tankless hot water coil added, the unit furnishes not only heat but hot water supply as well. Write for complete details.

GULF STREAM Standard

Comes fully erected, equipped with a complete set of automatic controls for 115 volt, 60 cycle operation, including thermostat, stack switch and limit control. Combustion chamber is installed. Top jacket removable without disconnecting water piping.

HOT WATER HEATERS

Internally galvanized, high delivery direct heating, no slow storage. **SERIES "B"**—93 to 850 GPH at 100° F. rise. **SERIES "C"**—100 to 255 GPH at 100° F. rise.

Gulf Stream **PACKAGE**

Fully erected, pre-wired, accessory-equipped. Ready to set in place and connect. Easy to install and service.

ANOTHER BREEZE MARK PRODUCT

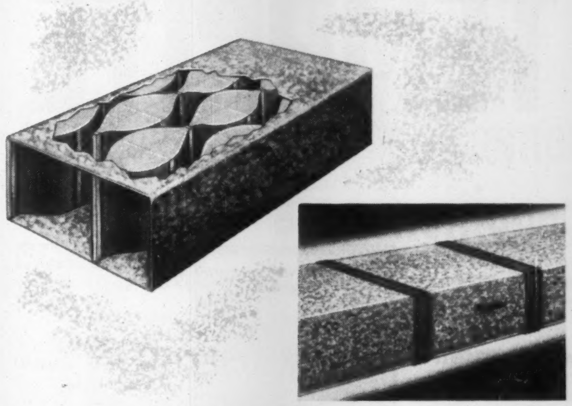
ALDRICH COMPANY

105 WILLIAMS STREET • WYOMING, ILLINOIS

A SUBSIDIARY OF BREEZE CORPORATIONS, INC.

AT LAST . . . THE ANSWER TO AIR CONDITIONING NOISE

AIRCOUSTAT PROVIDES PACKAGED SILENCING OF AIR AND FAN NOISES



CHECK THESE ADVANTAGES:

- ✓ 7 foot unit reduces noise level below what 100 feet of duct lining could accomplish.
- ✓ Pressure drop less than lining entire duct.
- ✓ Selection is no problem. If it fits geometrically, it fits acoustically.
- ✓ Easy to install. Only simplest tools needed.
- ✓ Constructed of galvanized steel or aluminum for long-life durability.
- ✓ Available in 11 standard sizes from 6" x 6" to 48" x 56" for use with all styles and sizes of ducts.
- ✓ Acoustically engineered to assure correct silencing of conditioned areas.

WRITE TODAY FOR COMPLETE SPECIFICATIONS

INDUSTRIAL SOUND CONTROL, Inc.
45 Granby St., Hartford, Conn.

Please send me more information on AIRCOUSTATS.

Name ....

Address ....

City .... State ....

SILENCE SERVICE

Industrial Sound Control Inc.
45 Granby Street, Hartford 12, Conn.

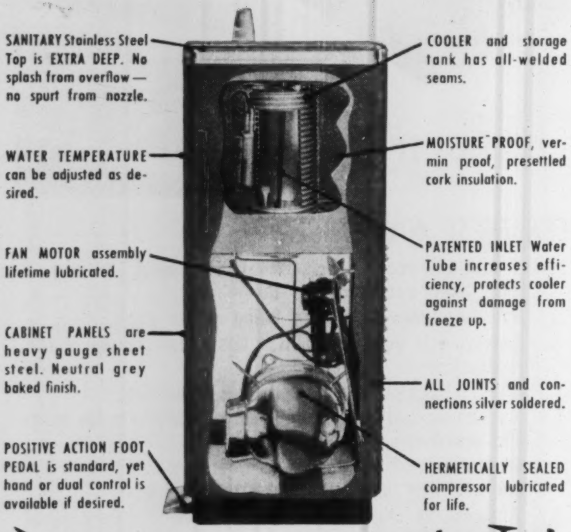
We invite you to...

LOOK INSIDE

it's the sturdy . . .

TEMPRITE

Drinking Water Cooler


SANITARY Stainless Steel Top is EXTRA DEEP. No splash from overflow — no spurt from nozzle.
WATER TEMPERATURE can be adjusted as desired.
FAN MOTOR assembly lifetime lubricated.
CABINET PANELS are heavy gauge sheet steel. Neutral grey baked finish.
POSITIVE ACTION FOOT PEDAL is standard, yet hand or dual control is available if desired.
COOLER and storage tank has all-welded seams.
MOISTURE PROOF, vermin proof, presettled cork insulation.
PATENTED INLET Water Tube increases efficiency, protects cooler against damage from freeze up.
ALL JOINTS and connections silver soldered.
HERMETICALLY SEALED compressor lubricated for life.

The Cooler with the DEEP Stainless Top!

Stainless Steel won't crack or chip.

Easy to clean and keep clean!

Temprite Products Corporation
P. O. Box 72-L, East Maple Rd.
Birmingham, Michigan

Send me distributor franchise information, I am interested in handling Temprite Water Coolers.

Name__________

Address__________

City__________ State__________

WHO'S WHAT . . .

[*Continued*]

For *ELLIOTT CO.*—A new sales office has been opened in New Orleans at 256 Lee Circle Bldg. to serve southern Mississippi and Louisiana. Its staff includes *G. C. BAYLES* as manager and *C. W. BRITT, JR.*, both formerly in the company's Atlanta office.

A new member of the Atlanta office is *F. L. HUMPHREY, JR.*, who has been named assistant district manager.

For *CARVER PUMP CO.*—*L. C. LANE* is regional sales manager in the midwest. Regional headquarters are at West Lafayette, Ind.

For *CHRYSLER CORP., AIRTEMP DIV.*—*LEHR DISTRIBUTORS, INC.* has been appointed wholesale distributor of room air conditioners in New York City and Long Island.

For *AIRTHERM MFG. CO.*, Heating Div.—Four new representatives are: *LAMB ENGINEERING CO.*, Baltimore, covering Maryland; *POWER BOILER SALES*, San Francisco, covering upper California; *ELDON G. THOMAS* of Oklahoma City, covering Oklahoma; and *INTERNATIONAL MFG. CO.* of Denver, covering Colorado.

For *ALLEN-BRADLEY CO.*—*RICHARD WESSLING* is district manager of the Chicago office. He succeeds John McC. Price, who has retired. Mr. Wessling formerly was vice president and director of the Electric Supply Corp.

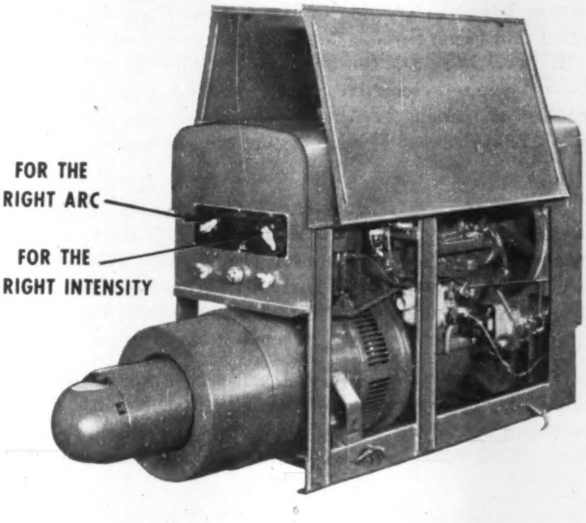
For *GENERAL ELECTRIC CO.*, Air Conditioning Div. — Two new sales regions have been added to make a total of six throughout the country. Cleveland and Atlanta are the new headquarters cities. The new southeastern region will include states from Maryland through Florida. Cleveland will be headquarters for the east central regional which runs from western Pennsylvania through Indiana and Michigan.

For *BRUNNER MFG. CO.*—The *SERVICE PARTS CO.*, 2511 Lake St., Melrose Park, Ill., is now exclusive distributor for the firm's line of "Open Type" refrigeration compressors and condensing units and for "Brunner-Matic" products. *PAT RAVANESE* is manager of Service Parts.

For the *PEERLESS ELECTRIC CO.*, Fan and Blower Div.—*JOSEPH A. BRAINARD* is sales representative in northeastern Ohio and western Pennsylvania. His address is 15904 Corsica Ave., Cleveland.

For *BALTIMORE AIRCOIL CO., INC.*—The following representatives have been named: *GEORGE V. ZINTEL*, 840 N. Michigan Ave., Chicago, covering northern Illinois and Indiana; *I. BEN KAGEY & ASSOC.*, 304 Teachwood Drive, N.W., Atlanta, covering Georgia; *J. L. BODINE & ASSOC.*, 122 W. Lockwood Ave., Webster Groves, Mo., covering southern Illinois; *JAMES C. GANT, SR.*, Gant

"SHIELD-ARC" SA-200 DUAL CONTROL



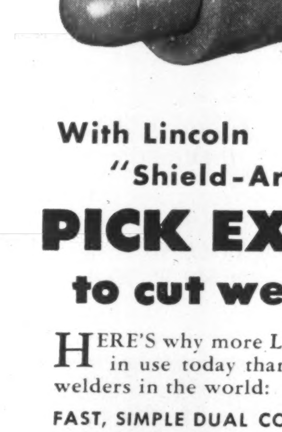
With Lincoln "Shield-Arc" you

PICK EXACT ARC to cut welding costs

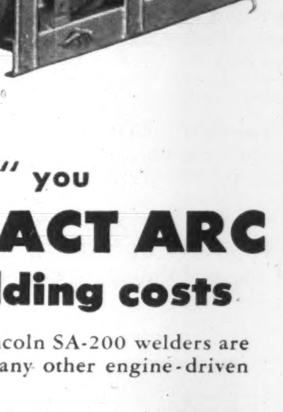
HERE'S why more Lincoln SA-200 welders are in use today than any other engine-driven welders in the world:

FAST, SIMPLE DUAL CONTROL assures right type arc and right arc intensity for every job. This means that the operator can suit the arc to the job every time for flat, vertical or overhead welding.

COMPACT DESIGN provides long, dependable service, low-cost operation, highest quality welding.



Welding 6-inch flange *to elbow at the valve in refinery addition using "Shield-Arc" SA-200 with 5/32" "Fleetweld" electrodes.*



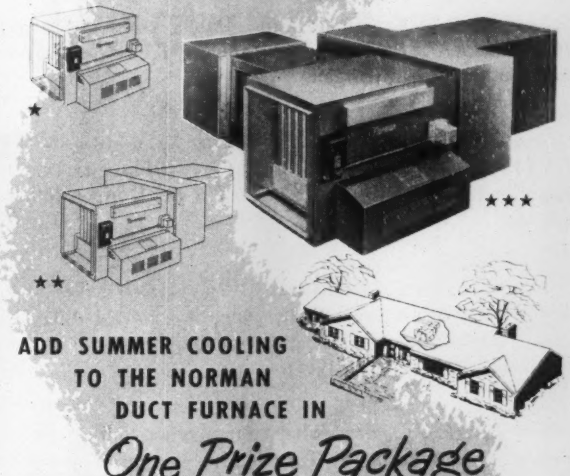
Welding 20 foot sections *of ice plant piping with "Shield-Arc" engine driven welder and 5/32" "Fleetweld 37" electrodes.*

SEE FOR YOURSELF. Compare "Shield-Arc's" money-saving features and low cost. Bulletin 1337, giving cost-cutting details, is available by writing on your letterhead.

THE LINCOLN ELECTRIC COMPANY
Dept. 3801 • CLEVELAND 17, OHIO

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

INSTALL ANY COMBINATION!



ADD SUMMER COOLING TO THE NORMAN DUCT FURNACE IN

One Prize Package

Norman winter-summer air-conditioner

. . . COMBINING a horizontal gas-fired furnace with independent cooling in ONE completely engineered package.

★ ***Start with the Norman Duct Furnace,*** if you like! A heating unit so flexible, it can be installed in the ducts of warm air and air conditioning systems for residential, commercial and industrial heating.

You'll find the Norman Duct Furnace adaptable to existing ductwork for use with the air handling unit of adequate summer air conditioning systems.

★★ ***Get set for summer cooling!*** Install the Norman Duct Furnace with its own damper compartment and blower now! Makes a complete gas-fired forced air heating system . . . ready for future summer cooling with most any refrigeration unit provided that ductwork is adequate for air conditioning.

★★★ ***Year 'round "Hidden Comfort" in ONE package:*** Norman Duct Furnace combined with cooling unit and blower makes complete year 'round air conditioning. The entire unit is so compact that it can easily and economically be installed in the attic or crawl space of to-day's modern homes.

Manufacturers of a Complete Line of Gas Heating and Air Conditioning Equipment

Norman® products company

1150 Chesapeake Ave., Columbus 12, Ohio

SEND for illustrated literature, complete with dimensions and specifications for your files

WHO'S WHAT . . .

[Continued]

Sales Co., 4144 Grassmere Lane, Dallas, covering Texas; *JOHN H. KELLER*, 2832 E. Grand Blvd., Detroit, covering southeastern Michigan.

A new branch office has been opened in Chicago by *DRAYER-HANSON, INC.* at 201 N. Wells St. Newly appointed manager of the office is *RALPH E. THORNROSE.*

For *CUTLER-HAMMER, INC.*—*J. T. RIDAY* is manager of the firm's branch sales office at South Bend, Ind. Mr. Riday, formerly of the Davenport, Iowa, office, succeeds the late Terry Fisher.

For *DRAVO CORP.*—The Atlanta office, under the supervision of William V. Timmis, Jr., has been moved to Room 361, 1401 Peachtree St., N.E. A new member of the Atlanta staff is *WHEELER M. BEARDEN*, formerly of the Pittsburgh office.

For *UNION ASBESTOS & RUBBER CO.*—*JOHN J. KRAMER and ASSOC.*, 1110 McMillan, Dearborn, Mich., has been appointed sales representative for "Unarco" heating and air conditioning units in Michigan and Toledo, Ohio.

For *DeBOTHEZAT FANS DIV., AMERICAN MACHINE and METALS, INC.*—Two sales territories have been increased. *J. M. PETTINGELL ASSOC.* will cover Rhode Island in addition to Maine, New Hampshire, Vermont and eastern Massachusetts. Pettingell's offices are at 210 Devonshire St., Boston. The territory of the upstate New York representative, *A. H. BURNAP*, has been increased to include the Albany-Schenectady area. Mr. Burnap's offices are at 940 Lancaster Ave., Syracuse.

For the *INTERNATIONAL HEATER CO.*—*J. W. CALHOON*, 3917 49th St., Des Moines, Iowa, is the new representative for Iowa, Nebraska and Kansas. New representative for western New York and northwestern Pennsylvania is *L. G. LININGER*, 925 Plum St., Erie, Pa.

THOMAS W. DRENNER, JR. has been appointed district sales manager for *ORANGEBURG MFG. CO., INC.* covering metropolitan New York, New Jersey, New England, Washington, D. C. and the eastern section of Pennsylvania.

For *INSUL-MASTIC CORP. of AMERICA*—New representative in Phoenix, Ariz., is *E. L. HAMILTON*, 2813 N. 25th Pl.

For *FENWAL INC.*—*H. TOM COLLINS* is manager of the new Chicago district office at 549 W. Washington St.

Where the problem is ventilation — the solution is a **WESTERN SYSTEM**

AT NORTHROP AIRCRAFT INC.

Problem: The Anaheim, Calif. Division of Northrop Aircraft, Inc. manufactures optical range finders and other ground weapon fire control devices for U.S. Army Ordnance. Dust-free ventilation a must! Solution: 38-30" Western Rotaries with Westernaire Curb-Mounted fans exhaust 18 million cubic feet of air per hour from the 250,000 sq. ft. building.

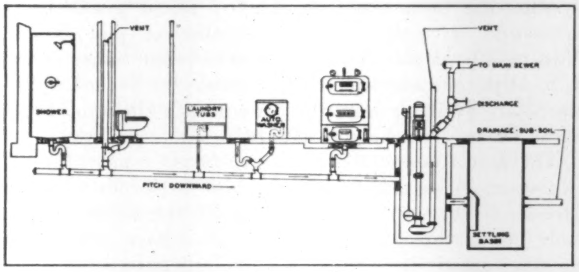
AT YOUR PLANT

Western Rotary ventilators, with or without fans, can do the most for you. A 2 mph wind operates the Western Rotary—and it continues to exhaust during wind lulls due to superior balance design. Years of trouble-free performance—bearings carry lifetime guarantee. Check Sweet's or AEC for high exhaust capacity figures. Then specify Western—a first-rate line of rotary, stationary, continuous ridge, directional ventilators and exhaust fans. Handled by wholesalers coast to coast.

Dealers—order from your local jobber.
Write for catalog, or tell us your special installation problems.

Western Engineering & Mfg. Co.
4118 OCEAN PARK AVE. • VENICE • CALIF.

BRIEFS
from The YEOMANS GUARD



How To Avoid Pumping Problems With Sub-Surface Drainage

This typical installation diagram shows how a vast amount of trouble can be avoided where a sump pump handles sub-surface drainage. The secret is the settling basin to settle out sand and grit. Without such a basin the sand and grit flow directly into a pump that was never intended to handle them — and serious damage to the pump bearing is almost a certainty.

A score of other tips on wet pit pumps — uses, selection, installation and maintenance — are contained in Yeomans Bulletin 3-8001. Check the box below and mail this ad to Yeomans for your free copy.

☐ ***Please send Bulletin 3-8001.***

★ ★ ★

This Yeomans Cellar Drainer Won't Tolerate Floods!

There's a simple way to defy floods — install a Yeomans Cellar Drainer. This subject presents an interesting study in human nature: So many buyers, eager to save a few bucks, choose a cheap pump — then pay out what they saved, many times over, year after year, getting the pump unclogged, unstuck, unrusted. Smart economy!

It's a fact that every year many Yeomans Cellar Drainers are installed to replace cheap drainers that wouldn't drain. A Yeomans Cellar Drainer is built like a Yeomans Municipal Pump — won't clog, or stick, or rust: just install it and forget it.

This is one problem that shouldn't be tolerated.

☐ ***Please send Drain-Dri Bulletin***

★ ★ ★

Sealed For 20 Years — Still Pumping!

. . . Among many intriguing stories about Shone Ejector performance, there's one we especially like:

A Shone installed in one of Chicago's best known buildings was inadvertently sealed off during alterations; and because it had not been listed in the mechanical equipment inventory, it was not missed. Twenty years later, when further alterations broke into its concrete tomb, there was the doughty Shone, pumping away as rhythmically as the day it was installed. The faithful Shone!

The Yeomans Guard, our periodical, containing news and helpful information on pump selection, applications and maintenance is available on request from your local Yeomans Representative (listed in the telephone book Yellow Pages under "Pumps") . . . or check box below and mail this advertisement to us. Be sure to give us your name, company name and address.

☐ **Send current issue of "The Yeomans Guard."**

YEOMANS BROTHERS COMPANY

2000-5 N. Ruby St., Melrose Park (Chicago), Illinois

Announcing DRAVO'S COMPLETE LINE OF HEATERS

THE DRAVO *Counterflo...*
40 Models
400,000 to 2,000,000 Btu/hr output
For large commercial and industrial buildings

THE DRAVO *Paraflo...*
4 Models
200,000 to 250,000 Btu/hr output
For smaller industrial or commercial buildings

THE DRAVO *Gas Fired* UNIT HEATER...
68,000 to 172,000 Btu/hr output
10 Models
For stores, service stations and other small buildings

ALL DRAVO HEATERS have automatic temperature control and a minimum efficiency of 80%... require no ductwork ... are ideal for heating in the winter, ventilation in the summer and for process drying.

DRAVO
CORPORATION
Sales Representatives in Principal Cities

Send the coupon for complete information

DRAVO CORPORATION, Heating Department
Fifth and Liberty Avenues, Pittsburgh 22, Penna.

DRAVO

Please send me complete information about the Dravo:

☐ **Counterflo Space Heater** ☐ **Paraflo Space Heater**
☐ **Gas Fired Unit Heater**

☐ Please have a representative call at no obligation to me.
Ask for Bulletin EF 598-4657.

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Company________
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catalog 54-F

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Double Seats

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everything you want in
FLOAT VALVES

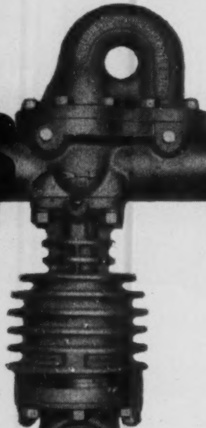
KECKLEY

No matter what your float valve needs may be, Keckley can meet them. For dependable level control, you can't beat Keckley valves. They're built to offer long service with minimum maintenance. And Keckley balanced float valves provide constant, uniform flow and positive closing. Sizes from 1/2" to 12". Screwed, standard or extra heavy flanges. Check with Keckley.

PRESSURE REGULATORS • TEMPERATURE REGULATORS • POP SAFETY VALVES • RELIEF VALVES • FLOAT BOXES • BALANCED VALVES FORGED STEEL GAUGES • MOTOR OPERATED VALVES • PUMP GOVERNORS • FLOAT VALVES • STRAINERS

1914 **O. C. KECKLEY CO.** 1954
400 W. Madison Street • Chicago 6, Illinois
40th Anniversary

pounds



NOT GUESSES

Install BUILDERS SHUNTFLO STEAM METERS right in your steam lines. Keep track of steam costs by seeing where steam is going and how much. Shuntflo Meters available in Model SMKS (shown) for 2" to 14" lines — Model SMDH for 1" and 1 1/2" lines. Write for Shuntflo Bulletins. Builders-Providence, Inc. (Division of B-I-F Industries, Inc.), 381 Harris Ave., Providence 1, R. I.

BUILDERS-PROVIDENCE
DIVISION OF B-I-F INDUSTRIES, INC.
BIF METERS FEEDERS CONTROLS

NEW BOOKS & REPORTS . . .

Shear Stresses in Piping Systems

More precise determination of shear stresses in piping systems has been made possible by recent government-sponsored research into characteristics of pipe bends. Two reports on this research, listed in recent issues of the U.S. Dept. of Commerce's Bibliography of Technical Reports, are available from the department's Office of Technical Services, Washington 25, D.C.

The first, *Characteristics of Pipe Bends Under Applied Moments*, shows that distribution and magnitude of shear stresses in curved metal tubes in which the bend radius is only two to three times the pipe radius have been found to differ greatly from those in a similarly curved rod.

Preliminary tests at the Naval Research Laboratory to determine the applicability of rod theory to tubes indicate that maximum shear stress in the bend may be more than 200 percent larger than that calculated for a curved rod of the same section. Similarly, this stress may be more than 300 percent larger than that calculated for a straight section of the same dimensions.

This report is available for 75 cents a copy.

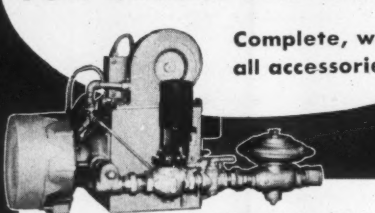
The second report, *Shear Stresses in Curved Tubes*, relates recently discovered characteristics of pipe bends at the Naval Research Laboratory to the work of earlier experimenters. Theoretical solutions to stresses and flexibilities of curved tubes are reported adequate when the bend radius is greater than 10-tube radii.

Such calculations are also sufficiently accurate for bend

NEW

COMBINATION BURNER FOR BOILER CONVERSIONS!

Complete, with all accessories



• New Eclipse Fan-Type Combination Gas-Oil Burner gives you peak efficiency with mixed, natural or LP gas (800 Btu to 3200 Btu) . . . #1, 2, or 3 fuel oil. Snap switch changes burner instantly to fuel selected . . . automatically sets all necessary controls in operation. "Cleanfire" starting delays fuel until blower delivers correct air for perfect combustion. Direct, electric spark ignition for oil—pilot ignition for gas. Safe, positive starting. Electronic control provides 100% efficient flame-failure protection. New built-in tuyere completes exclusive "rotary flame" action of burner. It's a complete burner installation. There's nothing else to buy or install. High quality construction assures years of heating service. Capacities from 400,000 to 2,250,000 Btu. Representatives in all principal cities.

Write for **Eclipse** **Bulletin R-100**

ECLIPSE FUEL ENGINEERING CO., 1139 BUCHANAN ST., ROCKFORD, ILL.
ECLIPSE FUEL ENGINEERING CO. OF CANADA, LTD., TORONTO, ONTARIO

radii as low as 2-tube when the bend turns through an angle of at least 90 deg and is not terminated by flanges or other constraints. For lesser bend angles and under conditions of constraint, this report gives more precise experimental values that are not explainable by present theoretical considerations. The report concludes that the lack of sufficient accuracy in present curved-tube theory is caused largely by the neglect of circumferential and radial shear stresses acting between elementary tube sections that are normal to the tube axis.

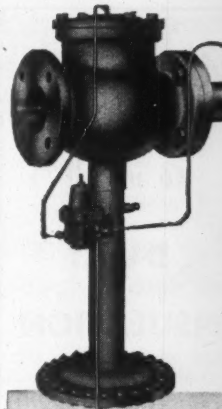
This report is available for 50 cents a copy.

Rating and Testing Air Conditioners

Methods of Rating and Testing Air Conditioners is the title of a standard recently issued by the American Society of Refrigerating Engineers bearing the number 16-53. This new standard supersedes standards 13, 16 and 16-R. It includes the cooling and the heating and other functions of self contained air conditioners, room air conditioners, remote type air conditioners, heat pumps and oil and gas fired air conditioners.

This latest revision affects primarily the room air conditioner portion of the standard and is for the purpose of providing alternate testing methods in addition to the calibrated room specified in the preceding standards.

The test apparatus described is basically the same type as described in the previous standards except for the in-



for more
accurate
pressure
control
the NEW
Klipfel
PILOT-OPERATED
REDUCING VALVE
No. 933

QUICK ACTING FOR MINIMUM PRESSURE VARIATION

When you need "on-the-button" steam pressure reduction, specify the new Klipfel Pilot-Operated Reducing Valve. Although extremely sensitive, its simple operation insures trouble-free service. Downstream pressure is sensed by the diaphragm of the pilot valve. The pilot valve uses upstream pressure to open the main valve if downstream pressure is too low; if too high, pressure is bled off to partially close main valve.

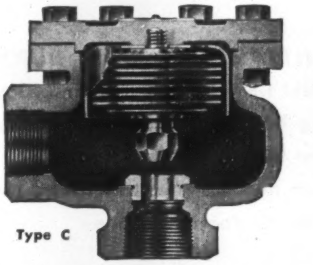
The next time you order a reducing valve, get the new standard for accurate control and low cost operation . . . Klipfel No. 933 Reducing Valve. Detailed literature on request.

Klipfel VALVES, INC.
1075 Lincoln Ave.
Hamilton, Ohio

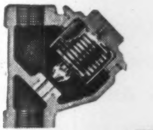
Nicholson Steam Traps Test
MAXIMUM CAPACITY
PER $ COST

One of the nation's largest plants recently conducted comparative tests of steam traps. They showed that Nicholson traps "provide lowest initial cost for handling larger amounts of condensate". Other Nicholson features: operate on lowest temperature differential; only one moving part; freeze-proof. See why leading plants are increasingly standardizing on Nicholsons for faster heat transfer. 5 types: size 1/4" to 2"; press. to 250 lbs.

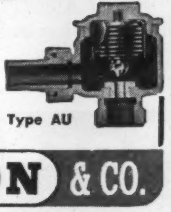
BULLETIN 853



Type C



Type AHV



Type AU

198 Oregon St., Wilkes-Barre, Pa.

W. H. NICHOLSON & CO.
TRAPS·VALVES·FLOATS

Air
Cooling
COILS
2 to 15 Ton
CAPACITY

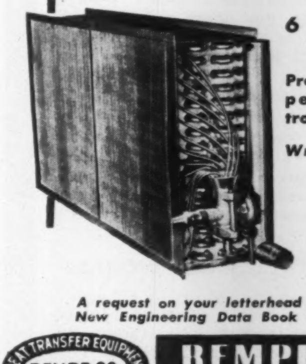
NEW Complete Line
REMPE
COMPLETE WITH MULTI-OUTLET EXPANSION VALVES
MADE-ON—
READY TO INSTALL

4 Row Coils —
for residential jobs.
6 Row Coils —
for commercial jobs.

Precision built to insure top performance and to give trouble-free service.

Write for bulletins and prices.

Complete facilities for fabrication of pipe coils — all types — all materials. Engineering service. Send details for price.



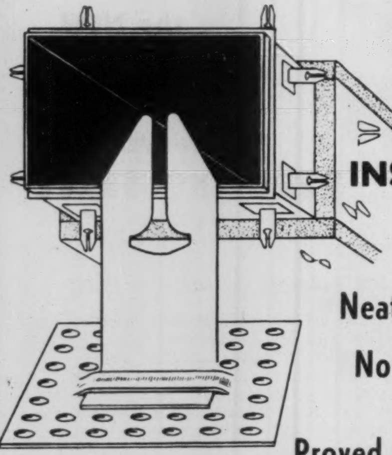
A request on your letterhead will bring free copy of New Engineering Data Book on Pipe and Fin Coils.

HEAT TRANSFER EQUIPMENT REMPE CO. Founded 1890
REMPE COMPANY
342 N. Sacramento Blvd., Chicago 12, Ill.

Use the *Stic-Klip* method

to install

DUCT INSULATION



Neat Appearance

No perforations in ducts

Proved labor savings

Durable Application

TYPE A STIC-KLIP
For use with Fiberglas and mineral wool felts

Illustrated literature mailed on request

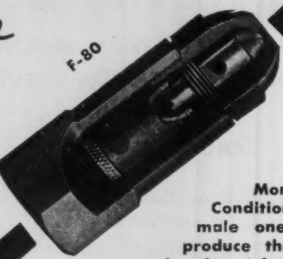
Stic-Klip MANUFACTURING CO. INC.
50 Regent St Cambridge 40 Mass

Monarch

NOZZLES

for

HUMIDIFYING



Monarch Brass F-80 Air Conditioning Nozzles (or 1/4" male one-piece H-261 style) produce the finest possible breakup of small capacities with low direct pressure only. No air required.

The most popular size is #3.00 which operates on as little as 25 pounds pressure, delivers 1.00 gph and produces a very wide angle of spray (120°) in a fine, soft, fog-like mist.

Available in 25 different capacity sizes from .57 gph upwards, all Brass construction with 120 mesh Monel screen strainers.

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MONARCH MANUFACTURING WORKS, INC.

2523 E. Ontario St. PHILA. 34, PENNA
CANADIAN SALES AGENT (EXCEPT B.C.) CANADIAN GENERAL FILTERS LTD., 2679 DANFORTH AVE., TORONTO 13.

NEW BOOKS & REPORTS . . .

[*Continued*]

clusion of the calibrated room calorimeter, which is primarily intended for testing room air conditioners of the free-delivery type.

The new standard is priced at $1.00 and may be obtained from the American Society of Refrigerating Engineers, 234 Fifth Ave., New York 1.

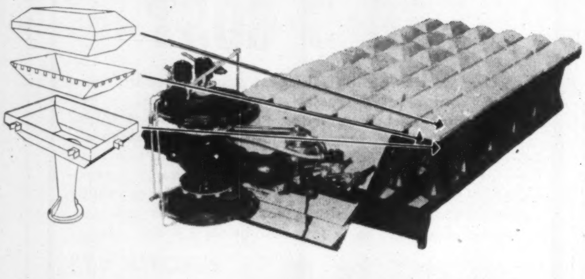
Repair Welding of Cast Iron Pipe, Valves, Fittings

Recommended Practice for Repair Welding of Cast Iron Pipe, Valves and Fittings is the result of a set of worked out procedures giving practical details of repair methods. Materials covered include gray iron, white cast iron, chilled cast iron, malleable iron, alloy cast iron and nodular cast iron. The welding processes for which procedures are given include arc welding with nickel electrodes, mild steel electrodes, cast iron electrodes and copper-base electrodes; oxy-acetylene welding and braze welding; and carbon arc welding. This publication tells how to prepare a casting for welding. It also tells what postweld heat treatments are required and describes the effects of welding on castings.

These practices are equally applicable to all castings, although they are written specifically for pipe, valves and fittings.

Copies are available at 50 cents each from the American Welding Society, 33 W. 39th St., New York 18.

for Gas Firing



The UPSHOT TRULIRADIANT GAS BURNER **for vertical firing of steel firebox, cast iron and brickset boilers. An outstanding burner with specially designed refractory protection for burner heads insuring long life and providing maximum heat transfer to boiler surfaces for high efficiency. *Write for literature.***

Gordon & Piatt
P. O. BOX 332
WINFIELD, KANSAS

MEETINGS & CONVENTIONS...

The *NATIONAL WARM AIR HEATING AND AIR CONDITIONING ASSOC.* has announced the schedule of the remaining college short courses for 1954. The dates, locations and names of the persons to be contacted for reservations are:

April 14-17, Penn State College, T. A. Wright, Room 103, Mechanical Engrg. Dept., State College, Pa.; April 19-21, Syracuse University, Prof. J. A. King, Mechanical Engrg. Dept., Syracuse, N.Y.; April 21-24, Iowa State College, Prof. Marvin Gould, Engrg. Extension Service, Ames; July 13-16, University of Wisconsin, Prof. R. C. Tegtmeyer, Mechanical Engrg. Dept., Madison.

Each course will present basic problems in combination heating and cooling and problems in advanced heating or advanced air conditioning. Commercial heating and cooling will be covered. The general fee for each school is $25.00.

1954 *SOUTHERN INDUSTRIAL WASTES CONFERENCE*—April 21-23, Hotel Shamrock, Houston, Texas. The conference is being sponsored jointly by the Manufacturing Chemists Association, the Southern Association of Science and Industry, and the Texas Chemical Council. The program will cover air and stream pollution problems including managerial as well as technical aspects. Conference chairman is L. L. Hedgepeth, American Cyanamid Co., Bound Brook, N. J.

CONFERENCE ON INSTRUMENTATION IN WATER, SEWAGE AND INDUSTRIAL WASTE TREAT-

FURNAS ELECTRIC
Pressure Switches

Tailored for Your Water System

A LOW COST Pump Control that Provides Enough Water for the Entire Family—Anytime

Style G6 Switch
Compact (2¾"x3½"x3"), for automatic pressure control of pumping systems. Silver contacts. Stainless steel springs easily replaced. Standard pressure range: 20 lbs. to 40 lbs.; max.: 80 lbs. 3 hp. Renewable diaphragm.

HERE'S A PACKAGE OF GOOD LIVING... known for its ability to provide water on demand for thousands of farm and suburban families. Nearly 2,000,000 of these Furnas Electric pressure switches are now installed coast to coast.

Compare Furnas Electric pump controls in any size for dependable service . . . for low maintenance . . . for low original cost . . . for ease of installation, wiring and quick adjustment . . . for attractive appearance. On every count you'll agree Furnas Electric controls can save you money.

For your best buy in water system controls, select Furnas Flectric.

FURNAS
ELECTRIC
Batavia, Illinois

For more facts, contact our nearby representative or write direct to the Furnas Electric Company, 1041 McKee Street, Batavia, Illinois.

go to a *SPECIALIST* for helical finned heat transfer tubing

- straight lengths
- compact coils for refrigeration condensers
- blast air heating coils
- blast air cooling coils

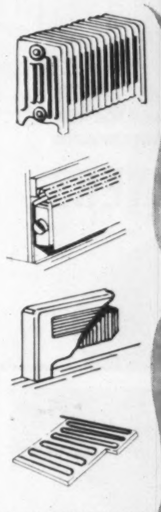
OVER 100 SIZES IN PRODUCTION

Made to your individual specifications!

ROME
TURNEY RADIATOR COMPANY

209 CANAL STREET **ROME, NEW YORK**

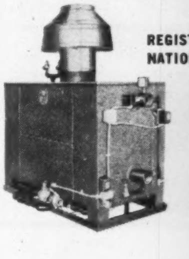
Easy to Install
PARKER BOILER
for more economy in
HOT WATER HEATING



AGA and ASME Approved

PARKER HOT WATER BOILERS are completely packaged units that do not require expensive brick setting or special foundations. They come to you complete, factory fire-tested, with all automatic controls installed and ready to operate. Units are available from 130,000 BTU to 3,300,000 BTU, in both oil and gas fired models.

PARKER HOT WATER BOILERS are economical to operate and easy to maintain. The double thickness steel all-welded tubing design provides consistent, trouble-free hot water operation for every type of heating.



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Write or wire for literature and specifications

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PARKER BOILER
MANUFACTURING COMPANY, INC.
2035 E. 37th St., Los Angeles 58, Calif.
Telephone ADams 3-4211

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Aerovent

Portable Utility

FANS

for product and personnel cooling • drying, exhausting and ventilating

Full 180° high-velocity air discharge. Mounts on ceilings, walls or floors. Heavy-duty rolled steel construction with expanded metal guards. Meets all safety standards. Available in sizes 16" to 36" for capacities to 20450 CFM

other models for every air-moving requirement

Certified Ratings

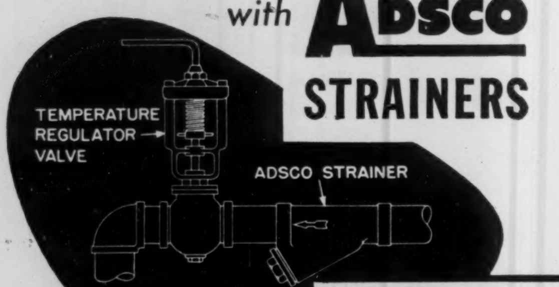
All Aerovent Fans are rated in accordance with the Standard Test Code and U.S.D.C. Comm. Std. CS178-51.

Ask for free folder P-50!

Aerovent Fan Company, Inc.

Ash and Branch Streets Piqua, Ohio

PROTECT Valuable Equipment with ADSCO STRAINERS



Y-TYPE STRAINERS

● Uniform, snug fit of screen in ADSCO Y-type Strainers is guaranteed by gasketed cap and tapered seats. When furnished with semi-steel body and perforated brass-sheet screen, these strainers are of 250 lb. design. Screen ratios as high as 8-to-1. Bodies and screens of other metals furnished for higher pressures and temperatures. Write for Bulletin 46-50B.

AMERICAN DISTRICT STEAM COMPANY, INC.
GENERAL OFFICES
NORTH TONAWANDA, NEW YORK
PLANTS: NORTH TONAWANDA, N. Y., AND RICHMOND, CALIF.

MEETINGS & CONVENTIONS . . .

[*Continued*]

MENT, sponsored by the Civil Engineering Dept., Manhattan College, 242nd St. and Broadway, New York 71, April 22. The program will include technical papers, discussions and instrument exhibits.

AMERICAN INDUSTRIAL HYGIENE ASSOC., 205 N. LaSalle St., Chicago 1—1954 Industrial Health Conference, April 26-30, Hotel Sherman, Chicago.

AIR POLLUTION CONTROL ASSOCIATION, 4400 Fifth Ave., Pittsburgh 13—47th annual meeting, Patten Hotel, Chattanooga, Tenn., May 3-6. Approximately 35 technical papers will be presented covering the subjects of coal, incineration, petroleum, municipal problems, dusts and fumes, steel, odors, measurements and meteorology.

Harry C. Ballman is executive secretary of the association.

AMERICAN WELDING SOCIETY, 33 W. 39th St., New York 18—1954 National Spring Technical Meeting, May 4-7, Hotel Statler, Buffalo, N. Y. The 1954 Welding and Allied Industry Exposition will be held at the Buffalo Memorial Auditorium, May 5-8.

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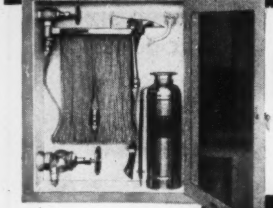

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MEETINGS & CONVENTIONS . . .

[*Continued*]

papers to be presented by the department of mechanical engineering is "A Comparative Analysis of Energy Storage Systems". Several papers to be presented by the Department of Mining and Petroleum Engineering will deal with the coal, petroleum and natural gas industries.

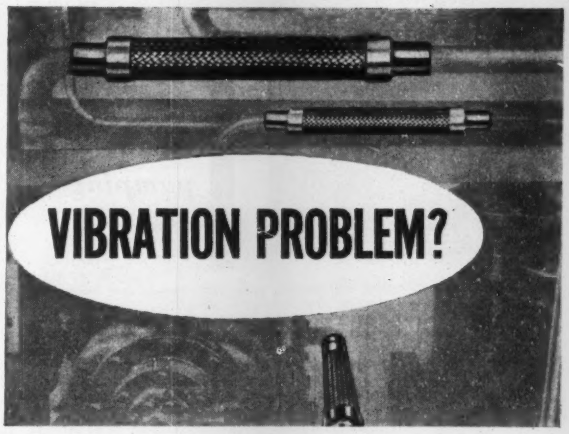
SHEET METAL CONTRACTORS NATIONAL ASSOC., 170 Division St., Elgin, Ill.—11th Annual Convention, May 10-12, William Penn Hotel, Pittsburgh. J. D. Wilder is executive secretary of the association.

MICHIGAN ENGINEERING SOCIETY—1954 Convention, May 7-8, Jackson. J. E. Wilbur is executive secretary.

OIL HEAT INSTITUTE OF AMERICA, INC., 500 Fifth Ave., New York 36—32nd annual convention, May 16-20, to be held concurrently with the 1954 National Indoor Comfort Exposition. Both events will be held at the Commercial Museum, Philadelphia.

Exhibitors of heavy oil burning equipment will invite architects and engineers to a special session to be held in the Commercial Museum on Wednesday, May 19, between 5 and 7 p.m. Experts on heavy fuel oil handling and combustion will be the speakers for this occasion.

HEATING, PIPING AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOC., Suite 1843, Rockefeller Plaza, New York 20—65th annual convention, May 24 to 28, Hotel Traymore, Atlantic City, N. J.



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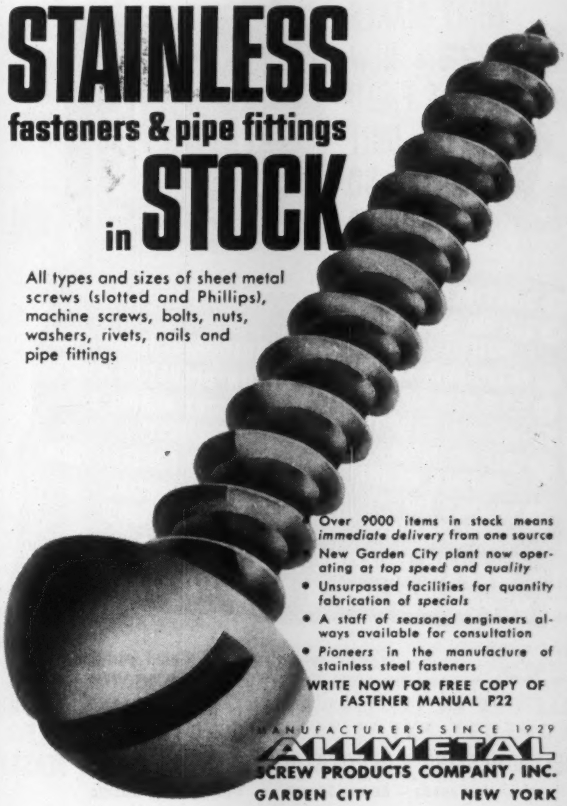

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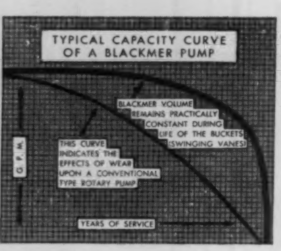

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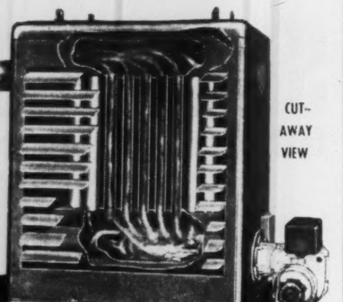

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MEETINGS & CONVENTIONS . . .

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NATIONAL DISTRICT HEATING ASSOCIATION, 827 N. Euclid Ave., Pittsburgh 6—45th Annual Meeting, May 25-28, The Greenbrier, White Sulphur Springs, W. Va. John F. Collins, Jr., is secretary-treasurer.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, 62 Worth St., New York 13—Semi-Annual Meeting, June 28-30, New Ocean House, Swampscott, Mass.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, 234 Fifth Ave., New York 1—41st Semi-annual Meeting, July 11-14, Hotel Olympic, Seattle, Wash.

21*st NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING*, under the management of the International Exposition Co., 480 Lexington Ave., New York 17—Commercial Museum, Philadelphia, December 2-7.

INTERNATIONAL HEATING & VENTILATING EXPOSITION—The Air Conditioning Exposition, January 24-28, 1955, Commercial Museum & Convention Hall, Philadelphia. Under the auspices of the American Society of Heating and Ventilating Engineers, and under the management of the International Exposition Co., 480 Lexington Ave., New York 17.

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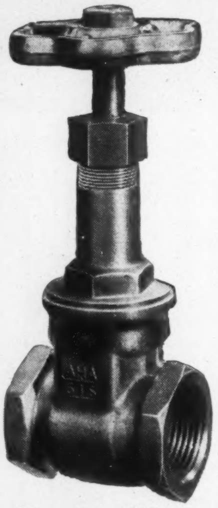

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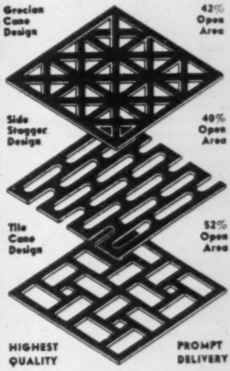

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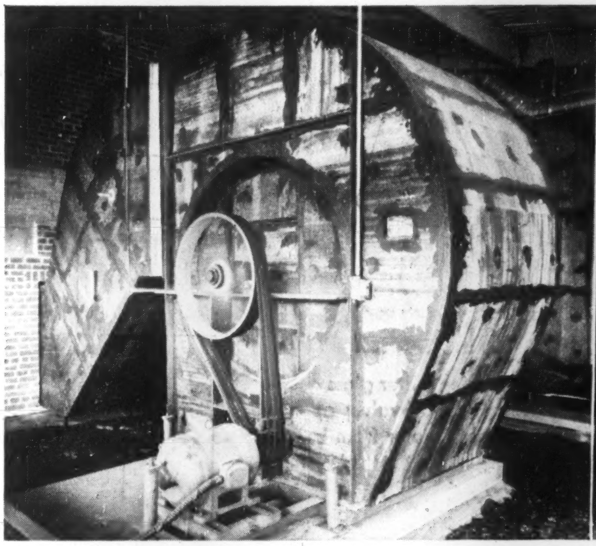
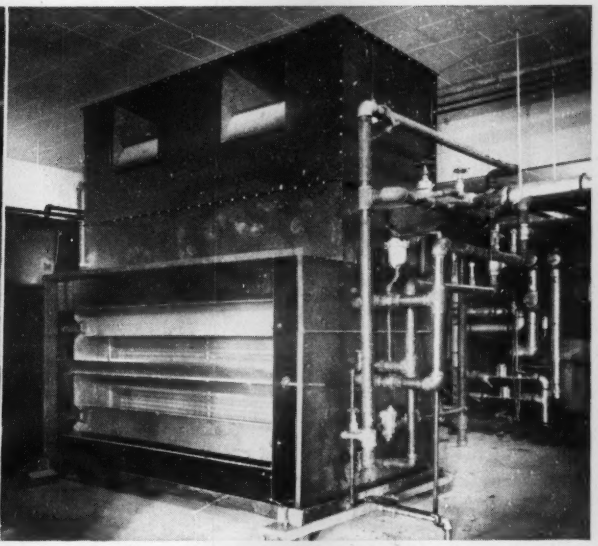


In its "work clothes" — completely insulated — one of the Clarage Type NH ventilating fans.



One of the Clarage Multitherm air conditioning units on the job — vertical type shown.

Typically Texas

Harris County boasts 2 new Court Houses at Houston. Clarage equipment installed in both!

Not one, but TWO . . . that's the number of Court Houses serving booming Harris County.

Likewise impressive is the amount of Clarage equipment selected for these two installations. In the **new** Harris County Court House: 49 Multitherm Units, 2 Unicoil Units, 22 fans. In the **remodeled** Harris County Court House: 37 Multitherm Units, 20 fans.

You, too, will find it makes sense to choose dependable Clarage equipment. Your inquiry is invited. **CLARAGE FAN COMPANY, Kalamazoo, Michigan.**

The new Harris County Court House at Houston, Texas. ARCHITECT: Finger and Rustay. ENGINEER: I. A. Naman. CONTRACTOR: Charles G. Heyne & Company.

CLARAGE
Service Manual
installation
initial operation
maintenance

YOURS FOR THE ASKING

This 68-page illustrated Service Manual provides valuable information adaptable to virtually any air handling job. Send for your free copy today.

You can Rely on... CLARAGE

Headquarters for Air Handling and Conditioning Equipment

CFCo

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

Don't forget the A-B-C's that sell boiler feeders

Everyone in the business knows that every steam boiler needs boiler water level control as much as it needs a water glass.

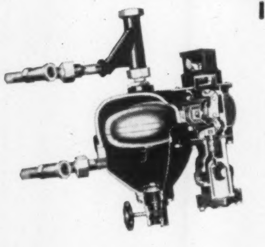
But now and then you run into the boiler owner who says: "It hasn't happened to me; I'll run the risk and save the dough."

That's the time it pays to get down to the A-B-C's of why boiler water feeders and low water fuel cut-offs are a good investment.

We are listing some of the basic "whys" here. Don't overlook these fundamentals. They start the sale off . . . and McDonnell quality clinches it.

McDONNELL & MILLER, INC.
3500 N. Spaulding Ave., Chicago 18, Illinois

Doing One M&M SAFETY CONTROLS *Thing Well*



And for those automatic jobs: A feeder-cut-off combination is a "must."

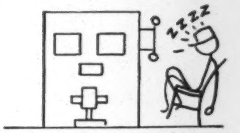
By its very nature automatic firing encourages an out-of-sight, out-of-mind attitude that can lead to troubles. The feeder cut-off combination makes the boiler water level as automatic as the firing—provides the two basic means of protection in one dependable unit:

1 **MECHANICAL CONTROL.** Feeding water to replace water evaporated.

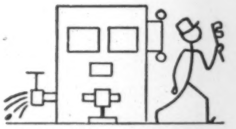
2 **ELECTRICAL CONTROL.** Stopping burner in the event of an emergency which causes the water level to fall into the danger zone.

There is a McDonnell Feeder-Cut-off Combination for every need. Ask for up-to-the-minute facts.

Your Jobber Stocks Them



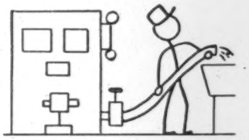
Not watching water glass



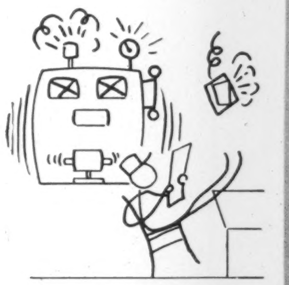
Leaving blow-off valves open

Carelessness or inattention

Not watching water glass
Leaving blow-off valves open
Drawing hot water from boiler
Draining without stopping firing



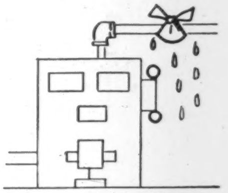
Drawing hot water from boiler



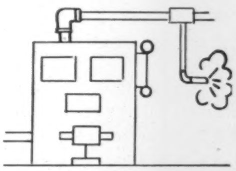
Runaway firing

Overfiring of boiler

Loss of water through safety valve discharge



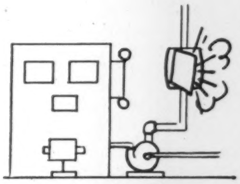
Leaky supply or return line



Steam used for process

Defects in system

Leaking air valves
Pump stoppage
Leaky supply or return
Condensate held up in system
Faulty check valves
Foaming or priming
Returns not pitched properly
Boiler leaks
Automatic control failure
Process use of steam; no condensate returned



Pump fuse fails

McDONNELL

Boiler Water Level Controls